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A National Study of Resource-Based Relative Value Scales for Physician Services

Volume 3

Cross-Specialty Analysis
Pre- and Post-Service Time and Work
Extrapolation
Relative Cost Differences Among Physicians' Specialty Practice
Measurement of the Amortized Costs of Specialty Training
The National Consultative Conference

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A NATIONAL STUDY OF RESOURCE-BASED RELATIVE VALUE SCALES FOR PHYSICIAN SERVICES

FINAL REPORT

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Symbols

---	Data not available
···	Category not applicable
-	Quantity zero

Chapter 6

Cross-Specialty Analysis

6.1 Introduction

One major goal of this study is to produce, on a single scale, resource-based relative values for services performed by physicians in different specialties. In Chapter 5, we describe the methodology of measuring the work of specific services within a specialty. These results indicate that physicians exhibit a high level of agreement on the relative work required to perform a set of selected services within their specialty. These separate specialty-specific RBRVSs, obtained using different services as reference standards for different specialties, cannot be directly related to each other. In this chapter we describe a method for relating these separate relative value scales to one another, resulting in an RBRVS using a common measure across the different specialties.

We have, as in other aspects of the study, pursued our work on two different but closely related tracks. One track is a technical process; the other is a consultative process. On the technical front, we have designed methods, gathered data, performed statistical analyses, and obtained preliminary results for cross-specialty comparison. Simultaneously, in the consultative process we have interacted from the inception of the study with panel physician consultants who were nominated by the AMA and their specialty organizations. These panels, called technical consultant groups (TCGs), were described in Chapter 3. A subset of members of these TCGs, including at least one physician from each specialty, constituted a cross-specialty panel. The names of the cross-specialty panelists are listed in Chapter 3 along with a chronology of cross-specialty meetings. The members of the cross-specialty panel met with us in a structured process designed to discuss potential methods of cross-specialty comparison, to provide specific information critical to performing such comparisons, and to evaluate the results of the process.

6.1.1 Alternative Methods of Cross-Specialty Comparison

An important issue was repeatedly raised for this study: how could the work input of physicians in one specialty be compared with the work input of another? How could such different kinds of activity as making diagnoses or designing strategies for management of an illness be compared to performing a difficult surgical procedure? Is not the work of certain specialties, such as radiology or psychiatry, intrinsically different from the work of other specialties? If so, how could one make specialty-to-specialty comparisons in a valid way?

We had analyzed several potential ways of comparing relative values scales of different specialties. One general class of methods relied on the judgment of experts to relate the separate scales. Such a method, which might employ the judgment of chiefs of medical or surgical services with broad knowledge of medical or surgical subspecialties, is clearly quite subjective. While we do not rule out or discount the value of such knowledge and judgments, we have chosen not to rest the critically important task of cross-specialty linkage solely on a process of this kind.

A second kind of approach might be characterized broadly as an incomes approach. In this approach, one would first come to some kind of agreement on what income, on average, is appropriate for each specialty. One then must determine what an average work load is for a physician in that specialty. This work load would be expressed in relative value units, as determined for the services in the specialty. The average income, divided by the relative value units of the work load, would give a specific conversion factor (dollars/relative value unit) for each specialty. Alternatively, the relative value scales could then be adjusted so that the specialty income would be achieved for each specialty with a common conversion factor. This approach has been more fully described by Roe (1981 and 1985).

A third approach to developing cross-specialty comparisons focuses more explicitly on negotiated fees or consensus methodology. Examples of these approaches are Egdahl and Hertenstein's (1985) access-oriented negotiated fee schedule used by Caterpillar Tractor; and Hadley and Berenson's (1987) incentive neutral fees. Both approaches utilize some type of negotiation process to determine the level of fees for individual services.

We think that these approaches are fundamentally inconsistent with the basic design and conception of this study, which is to measure the work of discrete services. Moreover, negotiated solutions may only lead to politically viable alternatives which can dissolve when the political constituents no longer concur with the decisions.

In this chapter we describe a structured, quantitative method for relating the separate specialty-specific RBRVSs to one another. Our rationale has been to design a method that can be subjected to critical scrutiny. Such a method should entail an orderly process, using explicit assumptions, objective data, and defined quantitative methods, each of which can be examined. We have developed a method of linking specialties by services of equal work. We present the results obtained when this method is applied to the data in the RBRVS. Lastly, we perform certain statistical tests on this process and the results of applying the method to the RBRVS data.

6.2 Methods: Linkage by Services of Equal Work Input

6.2.1 Assumptions for Linkage

The scales of the specialty-specific RBRVSs, which are generally based on different reference services, are not directly comparable across specialties prior to the cross-specialty alignment process. In the cross-specialty linkage process, we are aligning that part of each service that was measured in the survey, namely the intra-service work. The intra-service work (usually the patient encounter of an office service or the intra-operative portion of surgery) is the portion for which we have obtained the most precise measures of work. It is therefore this portion that we considered in our deliberations with physician panelists on services of equal work. In order to align the separate scales, we make the following assumptions:

(1) The mean ratings obtained from the national survey are reasonable for services within a specialty;

(2) When services in different specialties are judged to be the "same" or "equivalent", they involve nearly the same amounts of intra-service work; and

(3) Each specialty's scale as a whole is otherwise unchanged after alignment; that is, the ratios of all the services within the specialty remain the same.

Using these assumptions, our goal was to align the specialty scales of work in such a way that after alignment, services with the same values across specialties would reflect the same or equivalent levels of intra-work.

It is important to note that our objective here is simply to align the services of each specialty on a common scale. Following this alignment, pre- and post-work, practice costs, and opportunity costs can then be included. Regardless of whether we use intra-service work or total work to place the services on a common scale, the ultimate resultant relationship of the services in the RBRVS is unaffected. Since intra-service work is the portion we have measured most precisely, it is used to align the scales prior to including pre- and post-work.

6.2.2 Methods of Combining Ratings from Different Specialties into One Inter-Specialty Scale

We have used formal statistical methods to align the specialty scales. These methods are described below, qualitatively and quantitatively.

6.3 Selecting the Linking Services

To develop lists of services to be used in the cross-linkage process, we used an iterative process of selecting cross-specialty services that drew on the clinical experience of physicians in our technical consulting groups and on data from the national survey.

6.3.1 Pre-Survey Process of Selecting Cross-Specialty Services

We began developing lists of services for the cross-linkage process in the early stages of the study in conjunction with the development of the list of services for each specialty. In the process of developing the lists, we also asked TCG panelists to identify services performed in their specialties that were also performed in other specialties. For example, general surgeons identified tonsillectomy and adenoidectomy in a 10-year-old as a procedure that could be performed by themselves and by otolaryngologists.

We next identified a number of services in two or more specialties that were potentially the same. These are services that appeared on the lists of more than one specialty but which were not initially identified by TCG panelists as being the same service. This group of potentially same services have the same CPT-4 coding and the same wording in our national survey of physicians. We could not assume, however, that these were truly the same services in different specialties. Therefore, we convened the first cross-specialty panel in December, 1986, to identify which potentially same services the panelists believed to be truly the same in their respective specialties.

We considered procedures to be essentially the same if the vignettes describing them in the national survey were identically worded and:

(1) The processes of diagnosis and treatment followed by the respective specialties are the same;

(2) Times spent delivering the services are essentially the same; and

(3) The average patient seen in the respective specialties are roughly at the same degree of complexity. (That is, if different specialties see the same type of patients.)

In order to ascertain whether or not such services are essentially the same, we followed a structured process in the cross-specialty process. The format and process of deciding on whether or not a given service was the same were as follows:

(1) We discussed only services that were already on the lists developed and reviewed by physician panels;

(2) We discussed them in a structured, ordered sequence;

(3) Each service was described (process, time, patient complexity, and so forth) by a physician in Specialty A;

(4) Physicians in Specialty B (and additional Specialties C, D, ... in some instances) responded by describing similar attributes of the service in that specialty, and making a rating on whether the service was essentially the same in his or her specialty;

(5) The physician in Specialty A was asked whether he/she agreed with the rating of Specialist B (C, D, ...); and

(6) When there were several specialties, we inquired this

way into each pair of specialties, because we could not assume that if a procedure done by three specialties was the same for Specialty A and B, then it was also the same for Specialty C.

These discussions, while requiring the participation of physicians from the specialties concerned, were conducted in the larger group including other specialties, and were not limited to physicians in the specialties directly concerned.

We recognized that some specialties, because of their unique nature, might be linked by very few "same" services. Therefore, we developed a process of identifying, in different specialties, different services that are **equivalent**. Two procedures done in different specialties are defined to be **equivalent** if they:

(1) require equal amounts of time to perform; and

(2) involve essentially the same level of intensity.

In judging the level of intensity, we suggested that the panelists consider the dimensions of intensity shown in our investigations to be important: 1) the amount of mental effort, knowledge, and judgement involved in making decisions, 2) the degree of technical skill and physical effort, and 3) level of stress to the physician and risk to the patient.

The format and process used in judging whether services were equivalent were as follows:

(1) We used services that had already been included in the lists for the respective specialties;

(2) A physician from Specialty A described the procedure, including information on time and intensity;

(3) Physicians from Specialties B (C, D, ...) selected from the full lists of services and

procedures for their specialties a service that they considered equivalent. The physician in Specialty B described that procedure and Specialist A was asked whether he or she agreed that the service was equivalent;

(4) As in the discussion of services being discussed with respect to potential sameness, when three or more specialties suggested potentially equivalent services, physicians were asked to judge each two-way combination as to whether the services were equivalent for that pair of specialties; and

(5) As in the process for judging services that were potentially the same, the discussion of the services that were proposed as being equivalent was open to physicians from all specialties present at the meeting.

In identifying pairs of equivalent services evaluation and management services (E/M) were always matched with other E/M services, generally those performed in a comparable site (for example, office, hospital). Invasive services were always matched with other invasive services, and generally shared other characteristics as well (for example, endoscopic procedures, open procedures, clean versus contaminated procedures).

We identified 159 potentially same and equivalent service links prior to the first Cross-Specialty Panel meeting. The initial Cross-Specialty Panel meetings were conducted over a two day period in December, 1986. An agenda for the meeting was presented in Table 8. On the first day, we organized the discussion around four "broad specialties" (internal medicine, general surgery, family practice, and obstetrics/gynecology), whose work involves great breadth, and specialties that were likely to have services in common with them, primarily surgical specialties, such as thoracic surgery, and medical specialties, such as allergy and immunology. We devoted lengthy meetings to identifying, from a set of services that were potentially the same, those that were thought to be essentially the same.

An example of a cross-specialty service that met this test of being the **same** for the panelists from internal medicine, general surgery, and family practice was:

> Emergency hospital consultation for a 72-year-old, new patient, with possible bowel obstruction.

An example of a potentially same cross-specialty service (dermatology and obstetrics/gynecology) that was rejected by the cross-specialty panel was:

> Initial office visit for evaluation and counseling of 17-year-old female with primary genital herpes.

The panelists believed that the service by the obstetrician or gynecologist would be more comprehensive and time-consuming than that of the dermatologist for this class of patient. These views were subsequently borne out by data from the national survey, with average intra-service times of 27.5 and 19.4 minutes, respectively.

At the end of the this second session, we focussed the discussion of the panels on specialties that were not linked by at least two services to other specialties, with the aim of linking these specialties to others through services that were equivalent.

On the second day, we focussed our attention on those specialties that shared few services and procedures with other specialties. Physicians from the "broad specialties" joined the physicians from these less well-linked or "insular" specialties. After considering a small set of services that were potentially the same, these physicians gave most of their attention to identifying services that were equivalent in the "insular" specialties to services in the "broad specialties."

An example of services that, in the judgment of panelists, were equivalent is:

> (Obstetrics and Gynecology) Laparoscopic tubal sterilization by fulguration in a 35-year-old, and
>
> (Urology) Cystourethroscopy with insertion of indwelling ureteral stent.

An example of services that were discussed by panelists as potentially equivalent and rejected is:

> (Orthopedics) Unilateral lumbar laminectomy with excision of intervertebral disc, single level, without fusion, and;
>
> (Thoracic/Cardiovascular Surgery) Carotid endarterectomy, unilateral, 58-year-old female with history of transient ischemic attacks.

The panelists believed that, although the intra-service times for these two procedures were very close, the levels of risk and stress for the carotid endarterectomy were greater.

As a result of the Cross-Specialty Panel meeting, the 159 potential pairs of cross-specialty services were reduced to 132 cross-specialty services pairs that had been discussed and agreed upon. We were not able to use all of these same or equivalent procedures in the National Survey, however. Our survey firm advised us to limit the number of services and procedures to 22 to 24 per specialty. This meant that some of the services, particularly for the "broad specialties," needed to be deleted. Also, some of the cross-specialty links were with specialties, such as cardiology and gastroenterology, that are not included in this phase of the study. Following these deletions, we emerged with 103 links (88 same, 15 equivalent).

Since this process took place prior to the national survey, we have designated the services so identified as pre-survey cross-specialty services.

6.4 Review of Pre-Survey Cross-Specialty Services Following the National Survey

The national survey provided estimates of the intra-service time required for the link services. We tested the judgment of our cross-specialty panelists that the same or equivalent services required similar periods of time. The criterion that we used was that the services should not differ in time from each other by more than 25 percent. We deleted all cross-specialty service pairings that exceeded this time difference; slightly more than 25 percent of services were deleted as a result (18 same, 10 equivalent). Several specialties were poorly linked after this process. For some specialties this was due to the relatively small number of pre-survey links identified by the Technical Consulting Groups.

6.4.1 Post Survey Cross-Specialty Services

In addition to giving us more information to assess the suitability of the services chosen as links at the first Cross-Specialty Panel meeting, the national survey responses have enabled us to select additional pairs link services, designated post survey cross-specialty services. Most of these links were in the **equivalent** category. We chose clusters of potential links by searching our data base of over 300 surveyed services for those that were similar in category of work and in time. From these clusters, physician investigators selected links and presented them, with data from the national survey on intra-service time, to cross-specialty panelists for their comments at meetings in December, 1987, and February, 1988. The cross-specialty panelists selected other links directly from these clusters of potential links at these meetings. In Figure 2 we present a matrix of the total number of cross-specialty links by specialty. The final list of cross-specialty procedures for each specialty and the specialty with which they are linked is presented in Table 48. Appendix L further details the chronology of all the accepted links as well as rejected links.

6.5 Combining Ratings from Different Specialties

Different specialties' ratings of intra-service work cannot be compared directly. Because the standard service differed from specialty to specialty, the ratings from different specialties are in effect expressed in different units of measurement. We used the cross-specialty links to find out how the units from different specialties are related to each other.

To put it another way, we used the links to locate each specialty's standard on a common scale of the logarithm of intra-service work. The locations of the standards on the logarithmic scale showed us how the units from different specialties are related. Once we knew the relations between the units, we could put all the services from different specialties on a common scale of work.

Figure 3 illustrates the process informally in a hypothetical situation in which there are only two specialties. The left side of the figure shows the two original scales of logarithm of work, one scale for each specialty. Services A_1 and A_2 are considered to be linked: we assume the panels of experts judged them to require about the same amount of intra-service work. Services B_1 and B_2 form another link; C_1 and C_2 form another.

In the middle of part of Figure 3, the two scales have been aligned by sliding them up and down relative to each other so that within a pair of services that are considered to be linked, the locations of the two services agree as well as possible; the arrows in the left part of the figure show the directions in which the scales were moved to align them. After the scales have been aligned in that manner, they can be moved to the left and right to combine them into the common scale shown at the right of the figure. All services, irrespective of specialty, are now located on the common scale of the logarithm of work.

Note that when we slide one of the logarithmic scales at the left of Figure 3 up or down, we are in effect changing the unit in which the specialty's ratings of work are expressed. So when we slide the two scales up and down to make them agree as well as possible, we are in effect adjusting the two units of measurement to make the original, unlogged ratings agree.

Because there were 18 specialties, not just two, the process of alignment was more complicated, though in principle it was the same. To align the 18 scales of logged work we used a least-squares scheme that we now describe in detail.

6.5.1 A Technical Description of the Alignment Process

Let us use the subscript $\underline{i}$ to identify services. In assigning values of $\underline{i}$, we refrain from assuming that when the "same" service is performed by physicians from different specialties it really is the same. That is, we do not necessarily suppose an "emergency hospital consultation for a 72-year-old patient with possible bowel obstruction" is really the same when performed by a general surgeon as when performed by an internist; so we imagine it has two values of $\underline{i}$, one for general surgery and one for internal medicine. (Thus, in the language of analysis of variance, we begin by treating services as nested within specialties. The information about links will be introduced presently.)

When the approximately 100 physicians from specialty j were asked to rate the intra-service work required by service i, each physician's rating was in effect a judgment about the ratio of the work required by service i to the work required by the service that was the standard for the specialty. As was explained in Chapters 4 and 5, the Estimation-Maximization procedure provided an estimate of the mean of the population from which the common logarithms of those approximately 100 ratios were drawn, and also provided an estimate of the variance of the population.

Let d_{ij} be that estimate of the mean ratio of the population. Since d_{ij} is a judgement of the ratio of the work required by service i to the work required by the service that was the standard for the specialty, and the work of the standard service was defined to be 100, or 2.0 on the logarithm scale, d_{ij} for a service is equal to the group value on the logarithm scale for the service shown in the first column of Table 28, minus 2.0. To put it another way, d_{ij} is a distance on the logarithmic scale for specialty j: the distance from the specialty standard to service i.

When the service was involved in a link, the number of non-missing ratings was always in the neighborhood of 100, so a sufficiently precise estimate of the sampling variance of d_{ij} can be obtained by dividing by 100 the estimate of the variance of the population. Let σ_{ij}^2 be the resulting estimate of the sampling variance of d_{ij} (i.e., the square of the standard error of d_{ij}). (When there are exactly 100 non-missing ratings this estimate of the variance tends to be a shade too large. The Estimation-Maximization procedure in effect makes inferences about any missing ratings of work, and uses the inferences in estimating the population mean. So the estimate of the population mean is a bit more precise than it would be if it were based entirely on the 100 ratings that are not missing.)

These ds and σs were the inputs to the least squares procedure that provided a common scale of the logarithm of intra-service work. The procedure provided the location of each specialty's standard service on the common scale: the location of the standard for specialty j will be called b_j. The procedure also provided on the same scale a best-fit, compromise location for each set of services that were joined through one or more links: the compromise location for the set to which service i belongs will be called a_i.

To be specific, the as and bs were chosen to minimize a weighted sum of squares -- namely,

$$\Sigma \ (d_{ij} - a_i + b_j)^2 \ / \ \sigma_{ij}{}^2,$$

where the summation is over all js, and for any particular j, over all is such that service i is one end of a link between specialty j and at least one other specialty. The minimization was subject to three constraints:

(1) When two services that had been rated by different specialties were considered to form a link, their as were constrained to be the same.

(2) When service _i_ had been rated by another specialty and was considered to form a link with the standard service for specialty _j_, a_i was constrained to be equal to b_j.

(3) Because the origin of the common scale is arbitrary, the mean of the _b_s was constrained to have an arbitrary, convenient value that was in the neighborhood of $\log_{10} 100$.

When the _a_s and _b_s are chosen in that manner, $a_i - b_j$ can be regarded as the fitted valued that corresponds to d_{ij}. The deviation of d_{ij} from its fitted value will be called _e_; that is,

$$e_{ij} = d_{ij} - a_i + b_j.$$

The relations between the _a_s, _b_s, _d_s, and _e_s are shown in Figure 4. There are assumed to be several specialties and many links: one link is between Service 5, which was rated by Specialty 3, and Service 8, which was rated by Specialty 4. The left side of the figure shows parts of the scales of logged work for those two specialties before the scales have been aligned. Note that d_{53} is negative in this example, and d_{84} is positive: that is, Service 5 requires _less_ work than the standard for Specialty 3, and Service 8 requires _more_ work than the standard for Specialty 4.

The right side of Figure 4 shows the common scale that results from the alignment process. On it are shown: the locations of the specialty standards (b_3 and b_4); the locations of Services 5 and 8; and the compromise location ($a_5 = a_8$) for the set of linked services to which those two services belong. Note that e_{84} is negative in this example, and that $a_8 + e_{84} = b_4 + d_{84}$, which agrees with the equation for e_{ij} given above.

Similarly, e_{53} is positive, and $a_5 + e_{53} = b_3 + d_{53}$. Some comments on and criticisms of this alignment process will be considered in Section 6.5.7. A hypothetical example of the alignment process is presented in Appendix M.

6.5.2 Inputs to and Results from the Alignment Process

There were 133 cases in which a service that one specialty rated was linked to at least one service that was rated by another specialty or was the standard for another specialty. After applying the constraints specified in Section 6.5.1, there were 76 unconstrained as and bs -- i.e., 76 parameters to be estimated.

The inputs to and the main results from the process are displayed specialty by specialty in Table 49. It has a line for each service that was one of the 133 cases, and also a line for each specialty standard. The leftmost column shows: 1) the letter by which the service was identified in the questionnaire given to the specialty (an asterisk indicates the specialty standard); 2) a brief description of the service; and 3) in parentheses, the other services to which the service is linked. Each of those other services is identified by an abbreviation of the name of the specialty and by the letter that identifies the service within the specialty (an asterisk again indicates the specialty standard).

The third column of Table 49 shows the inferred location of the service on the common scale of the logarithm of intra-service work. (In the notation of Section 6.5.1, the entry in the column is $b_j + d_{ij}$ when the service is not the specialty standard, and is b_j when it is the standard.) The second column shows the antilogarithm of 2.0 plus the entry in the third. Since d_{ij} was measured as the ratio of the work required by service i to the work required by the standard service (which was defined to have a rating of 100), adding 2.0 (the common logarithm of 100) to $b_j + d_{ij}$ and taking its antilogarithm provides the location of the service on a common scale of unlogged work comparable to the scale used to obtain the d_{ij}s. The fourth column gives the deviation of the entry in the third column from the cross-specialty compromise location of the set of linked services to which the service belongs. (In Section 6.5.1, the deviation is called e_{ij}. Because of one of the constraints specified in that section, the deviation is necessarily zero when the service is the specialty standard.)

The fifth column of the table shows σ_{ij}, whose square, σ_{ij}^2. was one of the inputs to the alignment process described in Section 6.5.1. (The corresponding d_{ij}, which was another input, can be calculated from the values of $b_j + d_{ij}$ and b_j in the second column.)

Table 49 shows only those services that were specialty standards or were involved in links, or both. Table 50 shows the locations on the common scale of all services, including those omitted from Table 49. The rightmost column describes the service as in Table 49. The third column from the left shows the inferred location of the service on the common scale of the logarithm of intra-service work. (Here the entry in the column is $b_j + d_{ij} + 2.0$ when the service is not the specialty standard, and is $b_j + 2.0$ when it is the standard.) The first column on the left shows the antilogarithm of the third: it is again the location of the service on the common scale of unlogged work.

The fourth column of Table 50 gives a rough estimate of the precision of the location shown in the third. (Besides providing a b_j for each specialty, the minimization program provided an s_j that was an estimate of the standard error of b_j. The entry in the column is s_j when the service is the specialty standard, and is

$$\sqrt{s_j^2 + \sigma_{ij}^2}$$

when the service is not the standard.) The second column converts the entry in the fourth to a percentage on the scale of unlogged work. When the entry in the fourth is x, the entry in the second is

$$(10^x - 1) \times 100$$

6.5.3 Success of the Alignment, and Sources of the Imperfections

After alignment, the scales from the individual specialties agree well; indeed, the agreement is much better than some of the expert panelists had expected. The root-mean-square (square root of the mean of the squares) of the 133 deviations (the *e*s) shown in Table 49 is only 0.031, which corresponds to 7 percent on the scale of unlogged work (i.e., the antilogarithm of 0.031 is 1.07). In addition, the typical deviation in Table 49 for a specialty is, in general, similar across specialties.

Those deviations, which signal imperfections in the alignment, arise from two sources. One is random errors in the *d*s that were used in the alignment process. The other is imperfect links: even when the panelists decided two services could be linked, the two specialties' judgments about the work the services demand surely were not exactly the same. Table 51 shows estimates of what would happen if one or the other of those sources of error could be eliminated. Eliminating the imperfections in the links would have more effect than eliminating the random errors in the *d*s, but neither would make the success of the alignment spectacularly better.

The numbers in Table 51 come from the approximate equation

$$E\left[\frac{1}{n}\Sigma(e_{ij}/\sigma_{ij})^2\right]+\left(1-\frac{p}{n}\right) = \frac{1}{n}\Sigma(e'_{ij}/\sigma_{ij})^2,$$

in which:

n, which equals 133, is the number of cases used in the alignment;

the summations are over those *n* cases;

p, which is 76, is the number of parameters estimated in the alignment process;

e'_{ij} is the value e_{ij} would have if the random errors in the

$\underline{d}$s could be eliminated; and

E represents expected value, as it usually does.

(Even experienced users of least squares are often not familiar with the reasoning behind that equation; so it will be explained in Section 6.5.4.)

Because σ_{ij} does not differ widely from service to service, it is approximately true that

$$\frac{1}{n}\,\Sigma(e_{ij}/\sigma_{ij})^2 \doteq (\frac{1}{n}\,\Sigma\, e'_{ij}{}^2)/(\frac{1}{n}\,\Sigma\,\sigma_{ij}{}^2)$$

and that

$$\frac{1}{n}\,\Sigma(e_{ij}'/\sigma_{ij})^2 \doteq (\frac{1}{n}\,\Sigma\, e'_{ij}{}^2)/(\frac{1}{n}\,\Sigma\,\sigma_{ij}{}^2);$$

so the equation that was shown above becomes approximately

$$E\,[\frac{1}{n}\,\Sigma\, e_{ij}{}^2] \doteq \frac{1}{n}\,\Sigma\, e'_{ij}{}^2 + (1-\frac{p}{n})\,\frac{1}{n}\,\Sigma\,\sigma_{ij}{}^2.$$

The quantity in the square brackets on the left can be computed from the results of the alignment: it is 0.031^2 (see the bottom row Table 51). The second term on the right side can be computed from the inputs to the alignment: it is 0.019^2 (see the middle row in the table). So an approximately unbiased estimate of the first term on the left can be computed by subtraction: it is 0.025^2 (see the top row of the table).

6.5.4 Derivation of the Equation Used in Estimating the Root-Mean-Square of e'_{ij}/σ_{ij}

This section will assume familiarity with the matrix algebra that underlies multiple linear regression. It can be skipped without any loss of understanding of the sections that follow.

Let y, α, β, and ϵ be column-vectors, and let W and X be matrices. Assume that

$$y = W\alpha + X\beta + \epsilon,$$

and that ϵ is a random vector such that

$$E(\epsilon) = 0,$$

$$E(\epsilon\epsilon^T) = I\sigma^2.$$

(Here, 0 will stand for a matrix or column-vector whose elements are all zeroes.) Without loss of generality, we may assume that

$$W^TX = 0$$

-- i.e., that the columns of X have, so to say, been partialled out of each column of W already.

The column-vector $W\alpha$ can be described as the bias that would result from regressing y on the columns of X instead of regressing it on the columns of W and X. Assuming that X is of full rank, the column of fitted values obtained from the regression of y on the columns of X is

$$\hat{y} = X(X^TX)^{-1}X^Ty.$$

Then straightforward algebra, in which the assumption

$$W^TX = 0$$

is used frequently, provides the following expression for the residual sum of squares:

$$(y-\hat{y})^T(y-\hat{y}) = \alpha^TW^TW\alpha + \alpha^TW^T\epsilon + \epsilon^TW\alpha + \epsilon^T[I - X(X^TX)^{-1}X^T]\epsilon$$

The first term on the right is not a random variable; because of the assumption about $E(\epsilon)$, the expectations of the second and third terms are zero; and it is a familiar fact that the assumption about $E(\epsilon\epsilon^T)$ implies the expectation of the fourth term is $(n-p)\sigma^2$, where n is the number of elements in ϵ and p is the number of columns in X. Therefore,

$$E[(y-\hat{y})^T(y-\hat{y})] = \alpha^T W^T W\alpha + (n-p)\sigma^2,$$

or equivalently,

$$\frac{1}{n}E[(y-\hat{y})^T(y-\hat{y})] = \frac{1}{n}\ \alpha^T W^T W\alpha + (1-\frac{p}{n})\sigma^2$$

In applying that equation in the present context, note that the minimization described in Section 6.5.1 can be regarded as a multiple linear regression in which the elements of y are values of d_{ij}/σ_{ij}. The unconstrained as and bs are the regression coefficients, and the matrix X is such that the fitted value corresponding to d_{ij}/σ_{ij} is

$$a_i/\sigma_{ij} - b_j/\sigma_{ij},$$

and such that X embodies the three kinds of constraints specified in Section 6.5.1. In this application:

$$\alpha^T W^T W\alpha = \Sigma(e'_{ij}/\sigma_{ij})^2,$$

$$(y-\hat{y})^T(y-\hat{y}) = \Sigma(e_{ij}/\sigma_{ij})^2,$$

And to the extent that σ_{ij} is indeed the standard error of d_{ij},

$$\sigma^2 = 1.$$

This provides the equation used in Section 6.5.3 to estimate the root-mean-square of e'_{ij}/σ_{ij}.

Note that in this derivation, e'_{ij}/σ_{ij} has been treated as the bias introduced by imperfections in the choice of links. The columns of the matrix W represent unknown variables that describe those imperfections.

The equation is an approximation because the assumption about $E(\epsilon\epsilon^T)$ is not quite true. There is evidence that the ds, and therefore the ϵs, are positively correlated within a specialty (though not across specialties). It turns out that 0.025 percent is therefore really a lower bound on the typical deviation that would remain if random errors in the d̲s could be eliminated.

6.5.5 Implications of the Success of the Alignment

It is encouraging that the deviations that indicate imperfections in the alignment are so small. Unless some extraordinary series of coincidences has occurred, the small size of the deviations has these important implications:

(1) The links are on the whole good; that is, they connect services that the physicians in the two specialties would indeed regard as requiring nearly the same amount of intra-service work.

(2) The sampling errors of the d̲s from the individual specialties are small. This in turn implies that taking a sample of about 100 physicians from each specialty was a reasonable choice.

(3) The d̲s from different specialties are compatible; that is, the scales from the 18 specialties can be aligned to provide a good agreement between them.

The third implication is especially important. In Chapter 5 we saw that within each specialty the judgments about intra-service work and its dimensions were highly consistent in a way in which they should be if they are all valid -- i.e., if they are all realistic. Here we see that the judgments of intra-service work are consistent across specialties, as they should be if they are valid. Different specialties were asked to rate different sets of services, and it might have turned out that a physician's perception of a service was influenced by the other services he or she was asked to rate. Any such specialty-specific departures from realism must be small since the agreement between specialties is so good. Indeed, the agreement between specialties greatly strengthens the argument that the judgments of intra-service work are realistic.

6.5.6 Two Questions about the Choice of Links

A proper choice of links is of course vital in the process of alignment. This subsection considers two questions about the adequacy of the sets of links that were chosen.

6.5.6.1 Jackknife

Could the panelists have chanced to pick link services that permitted an unusually successful alignment, and might the success therefore be no more than a remarkable coincidence? To explore that question, we used the jackknife method (Mosteller and Tukey, 1977). We divided the 133 link services at random into 13 groups of 10 or 11 services. We then performed the alignment process 13 times, each time omitting one of the groups, and computed an estimate of the logarithm of the square root of the mean of the squares of the *e*s each time. By comparing those

13 estimates to the estimate obtained when all 133 link services were used, we could compute approximate confidence limits for what the logarithm of the square root of the mean of the squares of the *e*s would be if we had a very large number of link services. (So in the jargon of users of the jackknife, we "jackknifed the logarithm of the square root of the mean of the squares.") By taking antilogarithms, those limits can be converted into limits on the square root of the mean of the squares of the *e*s: the 90 percent confidence limits were 0.023 and 0.036. If the true, large-population value does indeed lie below 0.036, the 0.031 we obtained from our particular set of 133 services indicates that our particular set does not give a seriously optimistic impression of the success of the alignment.

In theory, those confidence limits assume the 133 services were a random sample from a very large population of link services -- an assumption we would be unable to defend if it were taken literally. However, we suppose the limits still give a rough impression of the extent to which our particular choice of services may have been unusual.

6.5.6.2 Types of Links

The second question was whether some kinds of links tend to be more exact than others, and whether the accuracy of the alignment might therefore be improved by giving extra weight to those links. We therefore tried grouping the links in various ways: 1) by the amount of information about time (pre-survey vs.

post) that was available when they were selected; 2) as "same" or "equivalent"; 3) by the type and setting of the services (office, hospital, evaluation and management, invasive, etc.); and 4) by the insularity or broadness of the specialties (i.e., links between broad and insular, between broad and broad, etc; see Figure 2). In none of those four cases did the groups differ markedly in the magnitudes of the deviations $\underline{e}$. We therefore concluded there was no point in trying to devise an alignment scheme in which some types of links would be weighted more heavily than others.

6.5.7 Comments and Criticisms

This section presents some comments on and criticisms of the alignment. Many of them suggest additional calculations that ought to be done sooner or later.

(1) If within a particular specialty, all the services that enter into links required less work than the services at the other ends of the links, the alignment procedure would not detect that fact. It would simply give an improperly high value to the work required by the specialty's standard service, and therefore to all services performed by the specialty. We have not yet agreed on a procedure for investigating this possibility, but we believe it should be investigated. In the meantime, we can only trust that the panels of experts chose the links with enough care so that any large, consistent tilt in the links to any one specialty was avoided.

(2) There is a sense in which the alignment process used medians of judgments of work, not means of the judgments. The estimates of population means obtained from the Estimation-Maximization procedure were estimates of means of logarithms of judged work. The antilogarithms of those estimates are estimates of the geometric means of the populations; the geometric mean of the population is approximately equal to the median when the distribution of the logarithms of the members of the population is approximately symmetric, as it typically was. So, the alignment procedure essentially used estimates of medians of judgments of intra-service work.

It would have been possible to use estimates of means instead of estimates of medians. If $\hat{\mu}$ and $\hat{\sigma}^2$ are the estimates (obtained from the Estimation-Maximization procedure) of the mean and variance of a population of judgments (logged to the base 10), and that population is reasonably symmetric, then

$$10^{\hat{\mu} + \hat{\sigma}^2(\log_e 10)/2}$$

is a good, approximate estimate of the mean of the population of unlogged judgments. The logarithms of those estimates could have been used as the ds in the alignment process. (In principle, the weights, σ_{ij}, should then be adjusted accordingly.) We doubt that the common scale of work would turn out to be very different, but finding out would be worthwhile.

If the scales did turn out to be different, then a new question would arise: Is fairness and justice better served by using means instead of medians to compare different specialties?

This is not a question that can be answered by purely statistical reasoning, but we should point out that because of the $\hat{\sigma}^2$ in the expression given above, the use of means would tend to give higher value to services about which physicians within a specialty disagree in their judgments of work.

(3) The alignment scheme that has been used here is one of a series of three schemes that become more and more complex because they use more of the information provided by the data. The simplest minimizes the sum of squares

$$\Sigma\ (d_{ij} - a_i + b_j)^2,$$

instead of minimizing the weighted sum of squares that was specified in Section 6.5.1. (The summation is still over the 133 link services described earlier.)

The next scheme is the one that has been used here -- the one described in Section 6.5.1. The expectations of the $\underline{a}$s and $\underline{b}$s are the same as in the first scheme but their sampling variances are smaller. The more nearly correct the σs, the smaller are the sampling variance.

The third scheme would reduce the sampling variances of the $\underline{a}$s and $\underline{b}$s even farther, still without changing their expectations. It would not only take account of the $\underline{\sigma}$s, but would also take account of the within-specialty covariances of the $\underline{d}$s. The computations would be complicated, and the scheme that has been used here worked well; so the third scheme has not been tried.

(4) There is another alignment procedure that is worth

considering. It was not used because the scheme that we used seemed to work well and the necessary combination of hardware and software was not readily available at the time, but it should be explored.

Instead of minimizing the weighted sum of squares specified in Section 6.5.1, this procedure would minimize

$$\Sigma\ (d_{ijk} - a_i + b_j)^2,$$

where d_{ijk} is the logarithm of the numerical judgement about service $\underline{i}$ given by the $\underline{k}$th physician in specialty $\underline{j}$. This procedure would automatically take account of the within-specialty covariances of the $\underline{d}$s, and would make use of any additional information that may have been lost by combining the judgments of individual physicians before aligning the scales from different specialties.

There would be another advantage. In dealing with a population in which there are outliers, the usual practice is to give less weight to an aberrant observation, letting the weight decline gradually as the observation departs farther and farther from the apparent mean of the sample. With this procedure, weights could be used in an analogous way: each of the squares that are to be summed could be weighted, with the weight decreasing according to the magnitude of the square. (This would require an iterative calculation, but of a familiar type.)

In the calculations that we have presented here, the individual judgments had to be weighted in a cruder way: as was explained earlier in Chapter 5, the logarithm of a judgment of work was given zero weight (i.e., was treated as missing) when it departed by more than three standard deviations from the value typical of the specialty, and was given full weight otherwise. We could not use graduated weights because the EM program that we used to compute summary statistics for a specialty could only treat an observation as missing (zero weight) or as present (full weight).

Our process for selecting link procedures is clearly critical to the resulting cross-specialty scale. The links were chosen after consultation with a relatively small number of physicians. There is a concern that these links may not be fully reproducible. What is the possible impact of this on the RBRVS?

It is difficult to answer definitively what the impact of links not chosen would have on the RBRVS, since this would require repeating the process and observing the result. On the other hand, our process assumed that redundancy -- several links for each specialty -- would protect against serious distortion due to a poor link. We used from 4 to 21 (median 7) links for each specialty. Furthermore, the availability of multiple links permitted statistical evaluation of the variability introduced in our linkage process. The results of this evaluation, which are described in this chapter, indicate that the variation introduced by using different links is acceptably small. We grouped links according to whether they were chosen by the pre-survey or post-survey process, whether they were same or equivalent, whether they involved certain types and settings of services, and whether they were links from "broad" specialties or "insular" specialties. In no case did the magnitudes of the deviations of the locations on the common scale from those in the specialty scales differ markedly from group to group. In the jackknife analysis described in Section 6.5.6.1 we estimated the size of the deviations for a hypothetically very large number of link services. The 90-percent confidence limits for the square root of the mean of the squares of deviations were 0.023 and 0.036. Our mean value of 0.031 suggests that there was nothing problematic about our particular set of link services.

A comment on the small number of persons involved in choosing the links is in order. We felt that it was essential to have an informed dialogue on each of these links and that this required face-to-face discussions among physicians from all the specialties. The large number of specialties (18) set practical limits on the number of persons per specialty. We therefore asked one or two physicians per specialty so that the size of the overall group would not inhibit discussion. We permitted physicians from specialties not involved in particular links to take part in the discussion and found that they frequently made valuable contributions to assessing particular links. Further, we know that the cross-specialty panelists shared information on the choice of links with the others on his/her specialty's TCG panel. After conferring with others on the panel, the cross-specialty panelist in several specialties (e.g., pathology and dermatology) asked that particular links be dropped and that others be selected. One result of this was that we held a second large cross-specialty meeting to select links.

An additional aspect worth noting is that the panelists were asked to select links only after a preliminary process of selection narrowed the range of possible links in a way that reduced the possibility of choosing services that were widely different in work. All links had to have been on the survey, so that we would have data on intra-service time. Secondly, we chose potential links that were in the same category of service. Thirdly, we matched services by site performed and by type of service. Lastly, we required that our intra-service times (from the survey) not differ by more than 25%. We deleted links chosen in the pre-survey process that differed by more than this amount. In the post-survey process we discussed potential links with survey data on intra-service time in the hands of the cross-specialty panelists. Half of our links (all the equivalent links) were chosen in this manner. The panelists were able to refer to the survey data on time and to focus their discussion on the other dimensions of work (mental effort, technical skill, and stress) in selecting links.

Overall, it appears that the identification of other "same" and "equivalent" services by different physicians would produce quite similar results.

Figure 2. Links used to produce the common scale.

BROAD SPECIALTIES				WELL-LINKED SPECIALTIES										INSULAR SPECIALTIES				Total	
FP	GS	IM	OB	AI	DM	MX	OR	OT	PE	RA	RH	TS	UR	AN	OP	PA	PY		
	2	8	3		2				3				1					FP	19
		1	1				2	1				3 1	2	1				GS	14
			1				1	1	1		1	1	1 1	1			3	IM	21
								2				1	2	1				OB	11
					1						2			1	1	1		AI	6
									1				1					DM	5
							1	1 1								1		MX	4
									1	1	1 2							OR	9
												1						OT	7
														1	1			PE	8
											2				2	1		RA	6
																	4	RH	12
																		TS	7
															3			UR	11
																		AN	5
																1		OP	8
																		PA	4
																		PY	7

Same Links = 40
Equivalent Links = 42
Total Links 82

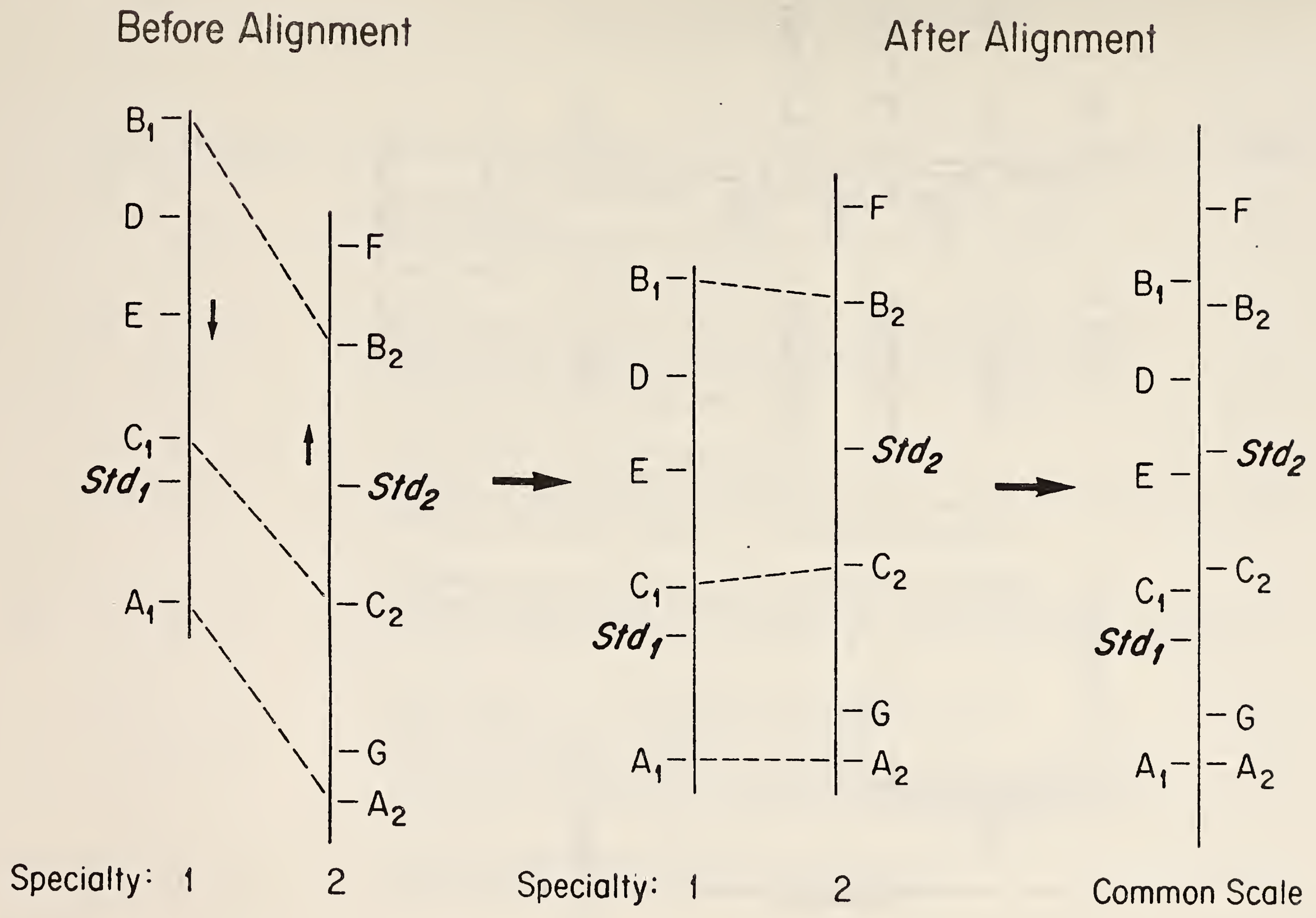
Legends and footnotes for Figure 2

Figure 2 Links Used to Produce Common Scale

Footnote for Figure 2

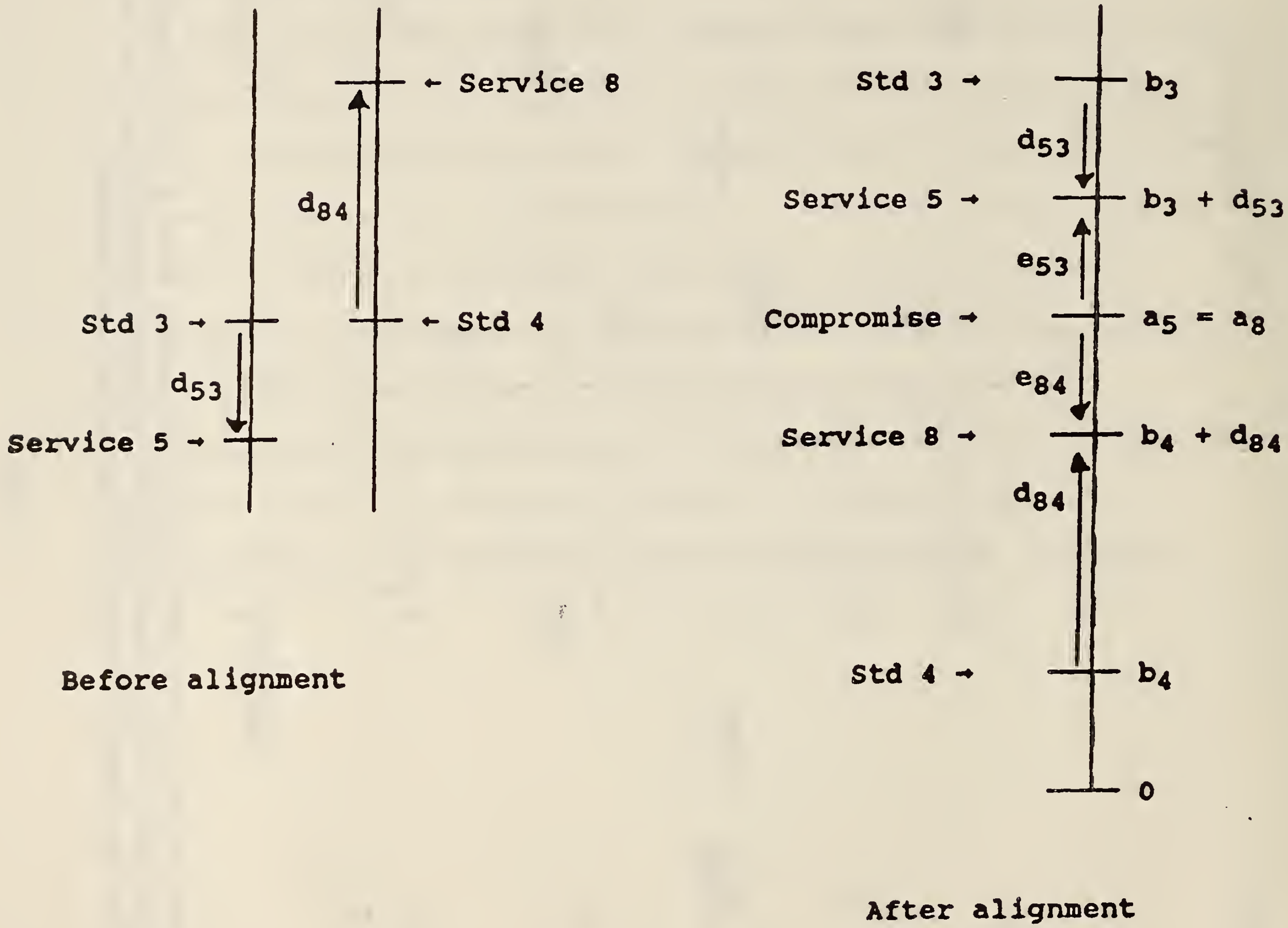
Each cell gives the number of links between specialties on the horizontal and vertical listings (same on left, equivalent on right). Totals are obtained by summing links in row and column for each specialty. Specialties are: FP family practice, GS general surgery, IM internal medicine, OB obstetrics and gynecology, AI allergy and immunology, DM dermatology, MX oral and maxillofacial surgery, OR orthopedic surgery, OT otolaryngology, PE pediatrics, RA radiology, RH rheumatology, TS thoracic and cardiovascular surgery, UR urology, AN anesthesiology, OP ophthalmology, PA pathology, PY psychiatry.

Figure 3. A qualitative view of the cross-specialty alignment process: specialty and common scales for work


Before Alignment
After Alignment
B_1
D
E
C_1
Std_1
A_1
F
B_2
Std_2
C_2
G
A_2
Specialty: 1
2
Specialty: 1
2
Common Scale

The link services (A, B, and C) serve to align individual logarithmic scales of work onto a common scale by a least squares method. Reference standard services (Std), used to establish the individual specialty scales, shift relative to one another. The relationships of services within the specialty scales and the ranges are unchanged.

Figure 4. The cross-specialty alignment process: the relation between the locations on the specialty and common scales for work


← Service 8
d_{84}
Std 3 →
← Std 4
d_{53}
Service 5 →
Std 3 →
b_3
d_{53}
Service 5 →
$b_3 + d_{53}$
e_{53}
Compromise →
$a_5 = a_8$
e_{84}
Service 8 →
$b_4 + d_{84}$
d_{84}
Std 4 →
b_4
0

Before alignment

After alignment

Table 48

List of final cross specialty links

Allergy and Immunology

Link	Specialty		Service description	Intra service time
1.	ai	I	Fibroscopic exam of nasal, choanal, pharynx for nasal polyps	20.1
	dm	A	Excision of changing pigmented lesion of back, 6x4 millimeters, 52 year old male	21.4
2.	op	B	Follow-up exam, established patient, including visual acuity, slit lamp, tonometry, brief fundus exam	14.5
	ai	*	Follow-up office visit for pharmacological management of 30 year old female with hay fever	15.2
3.	ai	B	Office visit, established patient, 6 year old child with sore throat and headache	15.5
	rh	*	Follow-up office visit of patient with ARA anatomical Stage II, and ARA functional Class II, rheumatoid arthritis	17.4
4.	rh	O	Comprehensive office visit for initial evaluation of 48 year old man with recurrent low back pain radiating to the leg	54.1
	ai	F	Initial office visit for evaluation of child with chronic wheezing	56.9
5.	an	V	Consultation for a transfusion reaction in patient with abrupt onset of fever & back pain	36.8
	ai	P	Medical conference by physician regarding medical management, with patient and/or family; counseling for avoidance, elimination, symptomatic treatment, and immunotherapy	36.8
6.	pa	F	Interpretation of serum immunoelectrophoresis	7.3
	ai	Q	Interpretation of serum immunoelectrophoresis	7.2

Table 48 continued

List of final cross specialty links

Anesthesiology

Link	Specialty		Service description	Intra service time
1.	an	H	Insertion of Swan-Ganz catheter	30.2
	gs	X	Insertion of Swan-Ganz catheter	31.7
2.	an	L	Anesthesia for dilation & curettage of uterus	25.6
	pe	I	Office eval. of head trauma in pre-school child w episode of vomiting, est. pt.	19.5
3.	an	V	Consultation for a transfusion reaction in patient with abrupt onset of fever & back pain	36.8
	ai	P	Medical conference by physician regarding medical management, with patient and/or family; counseling for avoidance, elimination, symptomatic treatment, and immunotherapy	36.8
4.	an	K	Anesthesia for repair of abdominal aortic aneurysm	241.1
	ob	H	Protracted labor requiring pitocin augmentation and electronic monitoring, primigravida, only time spent with patient	226.0
5.	an	U	Anesthesia for cesarean section	81.0
	im	A	Management of patient in acute pulmonary edema in emergency room who subsequently is admitted to hospital, established patient	66.1

Table 48 continued

List of final cross specialty links

Dermatology

Link	Specialty		Service description	Intra service time
1.	ai	I	Fibroscopic exam of nasal, choanal, pharynx for nasal polyps	20.1
	dm	A	Excision of changing pigmented lesion of back, 6x4 millimeters, 52 year old male	21.4
2.	dm	G	Office revisit for evaluation of 28 year old male with onychomycosis	8.7
	fp	B	Office revisit for evaluation of 28 year old male with onychomycosis	9.2
3.	dm	*	Follow-up visit w 48 year old male for ongoing management of psoriasis not PUVA tx	10.4
	pe	*	Office visit, established patient, 6 year old child with sore throat and headache	10.8
4.	ur	I	Diagnostic cystoscopy, office procedure in male with microhematuria	14.4
	dm	M	Curettage & electrodesiccation of 10 X 12 mm basal cell epithelioma (BCE) of cheek of 60 year old male	16.9
5.	dm	H	Obtain specimen for KOH slide & interp. of test	7.6
	fp	J	Obtain specimen for KOH slide & interp. of test	7.9

Table 48 continued

List of final cross specialty links

Family Practice

Link	Specialty		Service description	Intra service time
1.	fp	W	Comprehensive well child visit at 6 months, established patient (AAP guidelines)	16.9
	pe	C	Comprehensive well child visit at 6 months, established patient (AAP guidelines)	17.3
2.	fp	V	Emergency hospital consultation, 72 year old, new patient, with possible bowel obstruction	46.6
	gs	W	Emergency hospital consultation, 72 year old, new patient, with possible bowel obstruction	42.6
3.	fp	*	Foll-up vis w 55 year old male for mngmnt of hyptenson, mild fatigue, on beta blocker/thiazide regimen	13.3
	im	*	Foll-up vis w 55 year old male for mngmnt of hyptenson, mild fatigue, on beta blocker/thiazide regimen	15.6
4.	fp	C	Repair of 2 inch laceration of scalp, 14 year old male, office setting	22.5
	pe	P	Repair of 2 inch laceration of scalp, 14 year old male, office setting	20.2
5.	dm	G	Office revisit for evaluation of 28 year old male with onychomycosis	8.7
	fp	B	Office revisit for evaluation of 28 year old male with onychomycosis	9.2
6.	fp	O	O.V. with 45 year old male, est. pt., with chronic asthma, on chronic steroid & bronchodilator therapy	16.2
	im	I	O.V. with 45 year old male, est. pt., with chronic asthma, on chronic steroid & bronchodilator therapy	17.4
7.	fp	R	Scheduled monthly nursing home visit to established patient with Organic Brain Syndrome	16.5
	im	P	Scheduled monthly nursing home visit to established patient with Organic Brain Syndrome	15.4

Table 48 continued

List of final cross specialty links

Family Practice continued

Link	Specialty		Service description	Intra service time
8.	fp	Y	One supvsry conf with visiting nurse for antibiotic therapy in established patient with subacute bact. endocarditis	12.0
	im	X	One supvsry conf with visiting nurse for antibiotic therapy in established patient with subacute bact. endocarditis	14.4
9.	fp	M	Off eval for possib purulent bactrl conjunctivitis w 1-2 day hx redness & dschrge, 16 year old fem, est pt	11.2
	im	H	Off eval for possib purulent bactrl conjunctivitis w 1-2 day hx redness & dschrge, 16 year old fem, est pt	12.4
	pe	R	Off eval for possib purulent bactrl conjunctivitis w 1-2 day hx redness & dschrge, 16 year old fem, est pt	9.5
10.	fp	N	Routine periodic gynecologic exam, by primary care physician, 24 year old est. patient, w/o complaints	20.3
	ob	K	Routine periodic gynecologic exam, by primary care physician, 24 year old est. patient, w/o complaints	18.2
11.	fp	E	Rigid sigmoidoscopy, without biopsy, in office	20.4
	im	D	Rigid sigmoidoscopy, without biopsy, in office	18.4
12.	fp	P	Office evaluation of new onset RLQ pain in a 32 year old woman, established patient	24.4
	gs	S	Office evaluation of new onset RLQ pain in a 32 year old woman, established patient	26.0
	im	J	Office evaluation of new onset RLQ pain in a 32 year old woman, established patient	29.0
	ob	L	Office evaluation of new onset RLQ pain in a 32 year old woman, established patient	22.9
	ur	J	Initial evaluation & management of recurrent renal calculi in 40 year old male	29.6

Table 48 continued

List of final cross specialty links

			Family Practice continued	
Link	Specialty		Service description	Intra service time
13.	fp	K	Init vis pregn 25year old primgrvda, new pt, w compl hx, phys exm, risk assmnt, rout prenat lab eval, etc	43.1
	ob	C	Init vis pregn 25year old primgrvda, new pt, w compl hx, phys exm, risk assmnt, rout prenat lab eval, etc	34.5
14.	fp	Q	Office eval. of 28 year old pt. with regional enteritis, diarrhea & low grade fever, established patient	21.7
	im	L	Office eval. of 28 year old pt. with regional enteritis, diarrhea & low grade fever, established patient	26.2
15.	dm	H	Obtain specimen for KOH slide & interp. of test	7.6
	fp	J	Obtain specimen for KOH slide & interp. of test	7.9

Table 48 continued

List of final cross specialty links

Link	Specialty		Service description	Intra service time
			Internal Medicine	
1.	py	L	Hospital emergency room evaluation of 78 year old woman who ingested alcohol and valium in an apparent suicide attempt	60.8
	im	G	Emergency hospital consultation, 72 year old, new patient, with possible bowel obstruction	57.9
2.	fp	*	Foll-up vis with 55 year old male for mngmnt of hyptenson, mild fatigue, on beta blocker/thiazide regimen	13.3
	im	*	Foll-up vis with 55 year old male for mngmnt of hyptenson, mild fatigue, on beta blocker/thiazide regimen	15.6
3.	fp	O	O.V. with 45 year old male, est. pt., with chronic asthma, on chronic steroid & bronchodilator therapy	16.2
	im	I	O.V. with 45 year old male, est. pt., with chronic asthma, on chronic steroid & bronchodilator therapy	17.4
4.	fp	R	Scheduled monthly nursing home visit to established patient with Organic Brain Syndrome	16.5
	im	P	Scheduled monthly nursing home visit to established patient with Organic Brain Syndrome	15.4
5.	fp	Y	One supvsry conf w vst nurse for antibiotic thrpy in est. patient with subacute bact. endocarditis	12.0
	im	X	One supvsry conf w vst nurse for antibiotic thrpy in est. patient with subacute bact. endocarditis	14.4
6.	fp	M	Off eval for possib purulent bactrl conjunctivitis w 1-2 day hx redness & dschrge, 16 year old fem, est pt	11.2
	im	H	Off eval for possib purulent bactrl conjunctivitis w 1-2 day hx redness & dschrge, 16 year old fem, est pt	12.4
	pe	R	Off eval for possib purulent bactrl conjunctivitis w 1-2 day hx redness & dschrge, 16 year old fem, est pt	9.5

Table 48 continued

List of final cross specialty links

Internal Medicine continued

Link	Specialty		Service description	Intra service time
7.	im	S	Intial evaluation & management of recurrent urinary infection in female	25.9
	ur	O	Intial evaluation & management of recurrent urinary infection in female	26.2
8.	fp	E	Rigid sigmoidoscopy, without biopsy, in office	20.4
	im	D	Rigid sigmoidoscopy, without biopsy, in office	18.4
9.	fp	P	Office evaluation of new onset RLQ pain in a 32 year old woman, established patient	24.4
	gs	S	Office evaluation of new onset RLQ pain in a 32 year old woman, established patient	26.0
	im	J	Office evaluation of new onset RLQ pain in a 32 year old woman, established patient	29.0
	ob	L	Office evaluation of new onset RLQ pain in a 32 year old woman, established patient	22.9
	ur	J	Initial evaluation & management of recurrent renal calculi in 40 year old male	29.6
10.	fp	Q	Office eval. of 28 year old pt. w regional enteritis, diarrhea & low grade fever, established patient	21.7
	im	L	Office eval. of 28 year old pt. w regional enteritis, diarrhea & low grade fever, established patient	26.2
11.	im	B	O.V., sore throat, fever, & fatigue in 19 year old college student, est. pt.	13.8
	ot	B	O.V., sore throat, fever, & fatigue in 19 year old college student, est. pt.	12.4
12.	im	C	Aspiration of synovial fluid from knee, office procedure	14.6
	or	R	Aspiration of synovial fluid from knee, office procedure	11.5
	rh	E	Aspiration of synovial fluid from knee, office procedure	12.3

Table 48 continued

List of final cross specialty links

Internal Medicine continued

Link	Specialty		Service description	Intra service time
13.	an	U	Anesthesia for cesarean section	81.0
	im	A	Management of patient in acute pulmonary edema in emergency room who subsequently is admitted to hospital, established patient	66.1
14.	py	F	Supportive repeat hospital visit with long-term stabilized 42 year old male with chronic schizophrenia on anti-medication	21.5
	im	N	Follow-up hospital visit, day 2, patient with non-dominant CVA	17.6
15.	py	*	Second office visit after a referral from an internist of a 25 year old male suffering from panic attacks	43.7
	im	F	Initial office evaluation for diagnosis and management of painless gross hematuria in new without cystoscopy with mild hemiparesis	35.2
16.	im	K	O.V. for detailed eval. of recent onset syncopal attacks in 70 year old woman, established patient	37.8
	ts	N	Init office eval of 50 year old male w aortic aneurysm, w respect to recommendation for surg.	34.8

Table 48 continued

List of final cross specialty links

General Surgery

Link	Specialty		Service description	Intra service time
1.	fp	V	Emergency hospital consultation, 72 year old, new patient, with possible bowel obstruction	46.6
	gs	W	Emergency hospital consultation, 72 year old, new patient, with possible bowel obstruction	42.6
2.	an	H	Insertion of Swan-Ganz catheter	30.2
	gs	X	Insertion of Swan-Ganz catheter	31.7
3.	gs	B	Chest tube insertion for spontaneous pneumothorax, in 20 year old	14.9
	ts	B	Chest tube insertion for spontaneous pneumothorax, in 20 year old	15.7
4.	gs	A	Total esophagectomy w gastroesophageal anastomosis in chest	246.7
	ts	S	Total esophagectomy w gastroesophageal anastomosis in chest	250.2
5.	gs	E	Tracheostomy, emergency procedure, transtracheal, adult, for partial airway obstruction post trauma	21.3
	ts	R	Tracheostomy, emergency procedure, transtracheal, adult, for partial airway obstruction post trauma	23.6
6.	gs	F	Tonsillectomy & adenoidectomy in 10 year old child	28.7
	ot	*	Tonsillectomy & adenoidectomy in 10 year old child	30.0
7.	gs	U	Hospital visit, 3 days post uncomplicated cholecystectomy w common bile duct exploration	11.0
	ur	B	Follow up hosp. visit 2 days post uncomplicated TURP in 70 year old male	9.7

Table 48 continued

List of final cross specialty links

General Surgery continued

Link	Specialty		Service description	Intra service time
8.	fp	P	Office evaluation of new onset RLQ pain in a 32 year old woman, established patient	24.4
	gs	S	Office evaluation of new onset RLQ pain in a 32 year old woman, established patient	26.0
	im	J	Office evaluation of new onset RLQ pain in a 32 year old woman, established patient	29.0
	ob	L	Office evaluation of new onset RLQ pain in a 32 year old woman, established patient	22.9
	ur	J	Initial evaluation & management of recurrent renal calculi in 40 year old male	29.6
9.	gs	G	Low anterior resection forrectal carcinoma	151.9
	ts	H	Left upper pulmonary lobectomy, for squamous bronchogenic carcinoma	130.5
10.	gs	M	Decompression of carpal tunnel in 48 year old female, unilateral, ambulatory surgical unit	30.0
	or	*	Decompression of carpal tunnel in 48 year old female, unilateral, ambulatory surgical unit	27.2
11.	gs	P	Comprehensive office visit for initial evaluation of a 48 year old man with recurrent low back pain radiating to the leg	32.9
	or	I	Comprehensive office visit for initial evaluation of 48 year old man with recurrent low back pain radiating to the leg	29.0

Table 48 continued

List of final cross specialty links

Obstetrics and Gynecology

Link	Specialty		Service description	Intra service time
1.	fp	N	Routine periodic gynecologic exam, by primary care physician, 24 year old est. patient, w/o complaints	20.3
	ob	K	Routine periodic gynecologic exam, by primary care physician, 24 year old est. patient, w/o complaints	18.2
2.	ob	A	Init. office eval. of secondary amenorrhea, in 22 year old new patient, pregnancy excluded	27.2
	ot	I	Eval of recurrent dizziness & vertigo in 48 year old fem, w hx & phys, new pt, wo lab tests	28.0
3.	fp	P	Office evaluation of new onset RLQ pain in a 32 year old woman, established patient	24.4
	gs	S	Office evaluation of new onset RLQ pain in a 32 year old woman, established patient	26.0
	im	J	Office evaluation of new onset RLQ pain in a 32 year old woman, established patient	29.0
	ob	L	Office evaluation of new onset RLQ pain in a 32 year old woman, established patient	22.9
	ur	J	Initial evaluation & management of recurrent renal calculi in 40 year old male	29.6
4.	fp	K	Init vis pregn 25year old primgrvda, new pt, w compl hx, phys exm, risk assmnt, rout prenat lab eval, etc	43.1
	ob	C	Init vis pregn 25year old primgrvda, new pt, w compl hx, phys exm, risk assmnt, rout prenat lab eval, etc	34.5
5.	ob	O	Laparoscopic tubal sterilization by fulguration in 35 year old	30.5
	ur	Q	Cystourethroscopy with insertion of indwelling ureteral stent	31.5
6.	ob	S	Perf. of amniocentesis at 16 weeks gestation	20.0
	ts	L	Thoracentesis for total evacuation inpt. w effusion & suspected pulmonary tumor	25.8

Table 48 continued

List of final cross specialty links

Obstetrics and Gynecology continued

Link	Specialty		Service description	Intra service time
7.	ob	*	Diagnostic dilatation & curettage for menometrorrhagia in 50 year old female	12.9
	ot	D	Bilateral tympanostomy w tube insertion for recurrent otitis in 2 year old, general anesthesia	13.9
8.	an	K	Anesthesia for repair of abdominal aortic aneurysm	241.1
	ob	H	Protracted labor requiring pitocin augmentation and electronic monitoring, primigravida, only time spent with patient	226.0

Table 48 continued

List of final cross specialty links

Ophthalmology

Link	Specialty		Service description	Intra service time
1.	op	C	Compr eye exm, adlt pt wo spec complnts, w hx, visn test w Snlln Chrt, refrctn, motility tst, etc	27.9
	pe	F	Comprehensive well child visit at 15 years, new patient (AAP Guidelines)	27.4
2.	op	E	Secondary lens implant, w/o vitrectomy	38.8
	ur	C	Fulguration & resection of medium bladder tumor, 2 to 5 cms in 65 year old male	37.2
3.	op	Q	Fluorescein angiography for diabeticretinopathy, injection of dye & interp., one eye	33.2
	ra	N	Venography, unilateral, complete proc, for possbl deep vein thrombos of lower extremity, prf & intrp	27.7
4.	op	R	Endothelial cell count pre-operative for cataract surgery	13.0
	ur	R	Semen analysis for infertility	15.7
5.	op	B	Follow-up exam, established patient, including visual acuity, slit lamp, tonometry, brief fundus exam	14.5
	ai	*	Follow-up office visit for pharmacological management of 30 year old female with hay fever	15.2
6.	pa	H	Interpretation of a peripheral blood smear showing atypical lymphocytes	8.5
	op	P	Interpretation of fundus photography	10.0
7.	op	H	Diagnostic ultrasonography of eye ball with interpretation, B-Mode, for possible retinal detachment	20.3
	ra	R	Hysterosalpingography, complete procedure, in 26 year old woman with infertility	23.6

Table 48 continued

List of final cross specialty links

Ophthalmology continued

Link	Specialty		Service description	Intra service time
8.	op	A	Penetrating keratoplasty, cataract extraction & intraocularlens implantation, combined procedure	101.5
	ur	L	Percutaneous nephrostolithotomy, one stage, 2 cm stone or less	116.5

Table 48 continued

List of final cross specialty links

Oral and Maxillofacial Surgery

Link	Specialty		Service description	Intra service time
1.	mx	O	Unilateral Caldwell-luc procedure for maxillary sinus disease, w polyp removal	50.5
	ot	T	Unilateral Caldwell-luc procedure for maxillary sinus disease, w polyp removal	48.6
2.	mx	A	LeFort 1 max & sagit split mandibular osteotomies for correction of devlp deformity in 28 year old fm	253.3
	ot	A	Laryngectomy, w radical neck dissection for cancer in 65 year old male	258.3
3.	pa	E	Examination of an acid fast stained slide of a necrotizing granulomatous lesion of lymph node	17.0
	mx	L	O.V. for 45 year old female smoker w small oral ulcer on the lateral border of tongue	18.5
4.	mx	P	Closed reduction of mandibular fracture by manipulation & intermaxillary fixation, 24 year old male	64.4
	or	G	Reductn unstble closed comminutd fx distal radius, extrnal fixation w metallic type dev, ambsurg unit	56.2

Table 48 continued

List of final cross specialty links

Orthopedic Surgery

Link	Specialty		Service description	Intra service time
1.	gs	M	Decompression of carpal tunnel in 48 year old female, unilateral, ambulatory surgical unit	30.0
	or	*	Decompression of carpal tunnel in 48 year old female, unilateral, ambulatory surgical unit	27.2
2.	gs	P	Comprehensive office visit for initial evaluation of a 48 year old man with recurrent low back pain radiating to the leg	32.9
	or	I	Comprehensive office visit for initial evaluation of 48 year old man with recurrent low back pain radiating to the leg	29.0
3.	im	C	Aspiration of synovial fluid from knee, office procedure	14.6
	or	R	Aspiration of synovial fluid from knee, office procedure	11.5
	rh	E	Aspiration of synovial fluid from knee, office procedure	12.3
4.	or	K	Intermediate office visit, established patient with known osteoarthritis and painful swollen knees	16.5
	rh	N	Limited office visit, established patient with known osteoarthritis and painful swollen knees	17.2
5.	or	S	Performing and interpreting a lumbar myelogram, 68 year old female	32.9
	ra	S	Performing and interpreting a lumbar myelogram, 68 year old female	41.8
6.	or	H	Comprehensive initial office visit for evaluation of 13 year old female with progressive scoliosis	29.3
	pe	O	Follow-up visit for adolescent with behavior problem and difficult family, established patient	30.0
7.	or	Q	Interpretation of foot x-rays for possible fracture, complete radiograph exam for severe mid foot pain	5.1
	rh	B	Interpretation of x-rays of the hands, bilateral, in a patient with acute rheumatoid arthritis	5.2

Table 48 continued

List of final cross specialty links

Orthopedic Surgery continued

Link	Specialty		Service description	Intra service time
8.	mx	P	Closed reduction of mandibular fracture by manipulation & intermaxillary fixation, 24 year old male	64.4
	or	G	Reductn unstble closed comminutd fx distal radius, extrnal fixation w metallic type dev, ambsurg unit	56.2

Table 48 continued

List of final cross specialty links

Otolaryngology

Link	Specialty		Service description	Intra service time
1.	mx	O	Unilateral Caldwell-luc procedure for maxillary sinus disease, w polyp removal	50.5
	ot	T	Unilateral Caldwell-luc procedure for maxillary sinus disease, w polyp removal	48.6
2.	gs	F	Tonsillectomy & adenoidectomy in 10 year old child	28.7
	ot	*	Tonsillectomy & adenoidectomy in 10 year old child	30.0
3.	ob	A	Init. office eval. of secondary amenorrhea, in 22 year old new patient, pregnancy excluded	27.2
	ot	I	Eval of recurrent dizziness & vertigo in 48 year old fem, w hx & phys, new pt, wo lab tests	28.0
4.	mx	A	LeFort 1 max & sagit split mandibular osteotomies for correction of devlp deformity in 28 year old fm	253.3
	ot	A	Laryngectomy, w radical neck dissection for cancer in 65 year old male	258.3
5.	ot	E	Diagnostic fiberoptic bronchoscopy in pt. w suspected bronchopulmonary lesion	27.8
	ts	G	Primary diagnostic fiberoptic bronchoscopy in pt. w suspected bronchopulmonary lesion, w/o biopsy	29.6
6.	ob	*	Diagnostic dilatation & curettage for menometrorrhagia in 50 year old female	12.9
	ot	D	Bilateral tympanostomy w tube insertion for recurrent otitis in 2 year old, general anesthesia	13.9
7.	im	B	O.V., sore throat, fever, & fatigue in 19 year old college student, est. pt.	13.8
	ot	B	O.V., sore throat, fever, & fatigue in 19 year old college student, est. pt.	12.4

Table 48 continued

List of final cross specialty links

Pathology

Link	Specialty		Service description	Intra service time
1.	pa	F	Interpretation of serum immunoelectrophoresis	7.3
	ai	Q	Interpretation of serum immunoelectrophoresis	7.2
2.	ra	D	Barium enema, double contrast, complete procedure, for occult GI bleeding in a 55 year old male, performance and interpretation	23.6
	pa	I	Examination of a posterior cervical lymph node biopsy in a 46 year old man with splenomegaly, anemia and adenopathy	23.9
3.	pa	H	Interpretation of a peripheral blood smear showing atypical lymphocytes	8.5
	op	P	Interpretation of fundus photography	10.0
4.	pa	E	Examination of an acid fast stained slide of a necrotizing granulomatous lesion of lymph node	17.0
	mx	L	Office visit for 45 year old female smoker with small oral ulcer on the lateral border of tongue	18.5

Table 48 continued

List of final cross specialty links

Pediatrics

Link	Specialty		Service description	Intra service time
1.	fp	W	Comprehensive well child visit at 6 months, established patient (AAP guidelines)	16.9
	pe	C	Comprehensive well child visit at 6 months, established patient (AAP guidelines)	17.3
2.	fp	C	Repair of 2 inch laceration of scalp, 14 year old male, office setting	22.5
	pe	P	Repair of 2 inch laceration of scalp, 14 year old male, office setting	20.2
3.	an	L	Anesthesia for dilation & curettage of uterus	25.6
	pe	I	Office eval. of head trauma in pre-school child w episode of vomiting, est. pt.	19.5
4.	fp	M	Off eval for possib purulent bactrl conjunctivitis w 1-2 day hx redness & dschrge, 16 year old fem, est pt	11.2
	im	H	Off eval for possib purulent bactrl conjunctivitis w 1-2 day hx redness & dschrge, 16 year old fem, est pt	12.4
	pe	R	Off eval for possib purulent bactrl conjunctivitis w 1-2 day hx redness & dschrge, 16 year old fem, est pt	9.5
5.	op	C	Compr eye exm, adlt pt wo spec complnts, w hx, visn test w Snlln Chrt, refrctn, motility tst, etc	27.9
	pe	F	Comprehensive well child visit at 15 years, new patient (AAP Guidelines)	27.4
6.	dm	*	Follow-up visit w 48 year old male for ongoing management of psoriasis not PUVA tx	10.4
	pe	*	Office visit, established patient, 6 year old child with sore throat and headache	10.8

Table 48 continued

List of final cross specialty links

Pediatrics continued

Link	Specialty	Service description	Intra service time
7.	or H	Comprehensive initial office visit for evaluation of 13 year old female with progressive scoliosis	29.3
	pe O	Follow-up visit for adolescent with behavior problem and difficult family, established patient	30.0

Table 48 continued

List of final cross specialty links

Psychiatry

Link	Specialty		Service description	Intra service time
1.	py	F	Supportive repeat hospital visit with long-term stabilized 42 year old male with chronic schizophrenia on anti-medication	21.5
	im	N	Follow-up hospital visit, day 2, patient with non-dominant CVA	17.6
2.	py	*	Second office visit after a referral from an internist of a 25 year old male suffering from panic attacks	43.7
	im	F	Initial office evaluation for diagnosis and management of painless gross hematuria in new without cystoscopy with mild hemiparesis	35.2
3.	py	L	Hospital emergency room evaluation of 78 year old woman who ingested alcohol and valium in an apparent suicide attempt	60.8
	im	G	Emergency hospital consultation, 72 year old, new patient, with possible bowel obstruction	57.9
4.	py	O	Office visit for chemotherapy management of 44 year old male with bipolar depression	29.1
	rh	M	Follow up office consult of a 45 year old male with ankylosing spondylitis, iritis, and peripheral joint involvement	
5.	py	S	Office visit for diagnostic reevaluation of 68 year old female with chronic depression, unresponsive to treatment	50.0
	rh	H	Initial office evaluation of patient, with negative lab and x-ray studies, with question of fibrositis	50.5
6.	py	N	Office consultation for psychiatric evaluation of 65 year old male with intellectual deterioration and behavior problems including verbal and physical abuse of co-workers	61.8
	rh	C	Initial office evaluation of 70 year old female with polyarthralgia	54.4

Table 48 continued

List of final cross specialty links

Psychiatry continued

Link	Specialty		Service description	Intra service time
7.	py	D	Hospital consultation for psychiatric evaluation of a 68 year old cardiac surgical patient with severe post-op depression	62.5
	rh	D	Consultation in hospital, 35 year old female with fever, swelling joints and rash of one week duration	59.4

Table 48 continued

List of final cross specialty links

Radiology

Link	Specialty		Service description	Intra service time
1.	ra	P	Interp. of bone density study, dual photon absorptiometry of spine for quest of osteoporosis	6.3
	rh	L	Interp. of bone density study, dual photon absorptiometry of spine for quest of osteoporosis	8.6
2.	op	Q	Fluorescein angiography for diabeticretinopathy, injection of dye & interp., one eye	33.2
	ra	N	Venography, unilateral, complete proc, for possbl deep vein thrombos of lower extremity, prf & intrp	27.7
3.	ra	T	Interp. of hip x-rays, complete, for moderate/severe hip pain	4.5
	rh	Q	Interp. of hip x-rays, complete, for moderate/severe hip pain	5.9
4.	or	S	Performing and interpreting a lumbar myelogram, 68 year old female	32.9
	ra	S	Performing and interpreting a lumbar myelogram, 68 year old female	41.8
5.	ra	D	Barium enema, double contrast, complete procedure, for occult GI bleeding in a 55 year old male, performance and interpretation	23.6
	pa	I	Examination of a posterior cervical lymph node biopsy in a 46 year old man with splenomegaly, anemia and adenopathy	23.9
6.	op	H	Diagnostic ultrasonography of eye ball with interpretation, B-Mode, for possible retinal detachment	20.3
	ra	R	Hysterosalpingography, complete procedure, in 26 year old woman with infertility	23.6

Table 48 continued

List of final cross specialty links

Rheumatology

Link	Specialty	Service description	Intra service time
1.	ra P	Interp. of bone density study, dual photon absorptiometry of spine for quest of osteoporosis	6.3
	rh L	Interp. of bone density study, dual photon absorptiometry of spine for quest of osteoporosis	8.6
2.	ra T	Interp. of hip x-rays, complete, for moderate/severe hip pain	4.5
	rh Q	Interp. of hip x-rays, complete, for moderate/severe hip pain	5.9
3.	ai B	Office visit, established patient, 6 year old child with sore throat and headache	15.5
	rh *	Follow-up office visit of patient with ARA anatomical Stage II, and ARA functional Class II, rheumatoid arthritis	17.4
4.	rh O	Comprehensive office visit for initial evaluation of 48 year old man with recurrent low back pain radiating to the leg	54.1
	ai F	Initial office visit for evaluation of child with chronic wheezing	56.9
5.	im C	Aspiration of synovial fluid from knee, office procedure	14.6
	or R	Aspiration of synovial fluid from knee, office procedure	11.5
	rh E	Aspiration of synovial fluid from knee, office procedure	12.3
6.	or K	Intermediate office visit, established patient with known osteoarthritis and painful swollen knees	16.5
	rh N	Limited office visit, established patient with known osteoarthritis and painful swollen knees	17.2
7.	or Q	Interpretation of foot x-rays for possible fracture, complete radiograph exam for severe mid foot pain	5.1
	rh B	Interpretation of x-rays of the hands, bilateral, in a patient with acute rheumatoid arthritis	5.2

Table 48 continued

List of final cross specialty links

Rheumatology

Link	Specialty		Service description	Intra service time
8.	py	O	Office visit for chemotherapy management of 44 year old male with bipolar depression	29.1
	rh	M	Follow up office consult of a 45 year old male with ankylosing spondylitis, iritis, and peripheral joint involvement	22.1

Table 48 continued

List of final cross specialty links

Rheumatolgy continued

Link	Specialty		Service description	Intra service time
9.	py	S	Office visit for diagnostic reevaluation of 68 year old female with chronic depression, unresponsive to treatment	50.0
	rh	H	Initial office evaluation of patient, with negative lab and x-ray studies, with question of fibrositis	50.5
10.	py	N	Office consultation for psychiatric evaluation of 65 year old male with intellectual deterioration and behavior problems including verbal and physical abuse of co-workers	61.8
	rh	C	Initial office evaluation of 70 year old female with polyarthralgia	54.4
11.	py	D	Hospital consultation for psychiatric evaluation of a 68 year old cardiac surgical patient with severe post-op depression	62.5
	rh	D	Consultation in hospital, 35 year old female with fever, swelling joints and rash of one week duration	59.4

Table 48 continued

List of final cross specialty links

Thoracic/Cardiovascular Surgery

Link	Specialty		Service description	Intra service time
1.	gs	B	Chest tube insertion for spontaneous pneumothorax, in 20 year old	14.9
	ts	B	Chest tube insertion for spontaneous pneumothorax, in 20 year old	15.7
2.	gs	A	Total esophagectomy w gastroesophageal anastomosis in chest	246.7
	ts	S	Total esophagectomy w gastroesophageal anastomosis in chest	250.2
3.	gs	E	Tracheostomy, emergency procedure, transtracheal, adult, for partial airway obstruction post trauma	21.3
	ts	R	Tracheostomy, emergency procedure, transtracheal, adult, for partial airway obstruction post trauma	23.6
4.	ob	S	Perf. of amniocentesis at 16 weeks gestation	20.0
	ts	L	Thoracentesis for total evacuation inpt. w effusion & suspected pulmonary tumor	25.8
5.	ot	E	Diagnostic fiberoptic bronchoscopy in pt. w suspected bronchopulmonary lesion	27.8
	ts	G	Primary diagnostic fiberoptic bronchoscopy in pt. w suspected bronchopulmonary lesion, w/o biopsy	29.6
6.	gs	G	Low anterior resection forrectal carcinoma	151.9
	ts	H	Left upper pulmonary lobectomy, for squamous bronchogenic carcinoma	130.5
7.	im	K	O.V. for detailed eval. of recent onset syncopal attacks in 70 year old woman, established patient	37.8
	ts	N	Init office eval of 50 year old male w aortic aneurysm, w respect to recommendation for surg.	34.8

Table 48 continued

List of final cross specialty links

Urology

Link	Specialty		Service description	Intra service time
1.	im	S	Intial evaluation & management of recurrent urinary infection in female	25.9
	ur	O	Intial evaluation & management of recurrent urinary infection in female	26.2
2.	op	E	Secondary lens implant, w/o vitrectomy	38.8
	ur	C	Fulguration & resection of medium bladder tumor, 2 to 5 cms in 65 year old male	37.2
3.	gs	U	Hospital visit, 3 days post uncomplicated cholecystectomy w common bile duct exploration	11.0
	ur	B	Follow up hosp. visit 2 days post uncomplicated TURP in 70 year old male	9.7
4.	fp	P	Office evaluation of new onset RLQ pain in a 32 year old woman, established patient	24.4
	gs	S	Office evaluation of new onset RLQ pain in a 32 year old woman, established patient	26.0
	im	J	Office evaluation of new onset RLQ pain in a 32 year old woman, established patient	29.0
	ob	L	Office evaluation of new onset RLQ pain in a 32 year old woman, established patient	22.9
	ur	J	Initial evaluation & management of recurrent renal calculi in 40 year old male	29.6
5.	op	R	Endothelial cell count pre-operative for cataract surgery	13.0
	ur	R	Semen analysis for infertility	15.7
6.	ur	I	Diagnostic cystoscopy, office procedure in male with microhematuria	14.4
	dm	M	Curettage & electrodesiccation of 10 X 12 mm basal cell epithelioma (BCE) of cheek of 60 year old male	16.9

Table 48 continued

List of final cross specialty links

Urology continued

Link	Specialty		Service description	Intra service time
7.	ob	O	Laparoscopic tubal sterilization by fulguration in 35 year old	30.5
	ur	Q	Cystourethroscopy with insertion of indwelling ureteral stent	31.5
8.	op	A	Penetrating keratoplasty, cataract extraction & intraocularlens implantation, combined procedure	101.5
	ur	L	Percutaneous nephrostolithotomy, one stage, 2 cm stone or less	116.5

Table 49

Inputs to and results from the cross-specialty alignment

	Specialty, service, and in parentheses services to which linked	Location scale of work	Location scale of common log of work	e_{ij}	σ_i
	Allergy and Immunology (ai)				
*.	Foll-up ov for pharmacological mgmt of 30 yo F w hay fever (op B)	40	-0.395	0.000	...
B.	OV, est pt, 6 yo child w sore throat and headache (rh B)	47	-0.329	-0.001	0.0259
F.	Init ov for eval of child w chronic wheezing (rh O)	152	0.181	-0.003	0.0223
I.	Fibroscopic exam nasal, choanal, pharynx for nasal polyps (dm A)	100	-0.002	-0.002	0.0333
P.	Med conf w pt. and/or family, counseling for avoidance, etc (an V)	104	0.019	-0.014	0.0245
Q.	Interp of serum immunoelectrophoresis (pa F)	26	-0.579	-0.012	0.0369
	Anesthesiology (an)				
*	Anesth for inguinal hernia rep	96	-0.020	0.000	...
H.	Insertion of Swan Ganz catheter (gs X)	136	0.135	-0.019	0.0273
K.	Anesth for rep of AAA (ob H)	509	0.707	0.015	0.0194
L.	Anesth for D&C of uterus (pe I)	65	-0.185	-0.013	0.0187
U.	Anesth for cesarean section (im A)	231	0.364	0.001	0.0175
V.	Consult for transfusion react in pt w fever and back pain (ai P)	111	0.047	0.014	0.0252
	Dermatology (dm)				
*.	Foll-up visit w 48 yo M ongoing mgmt psoriasis not PUVA tx (pe *)	29	-0.536	0.000	...
A.	Excision changing pigmnted lesion back, 6x4 mm, 52 yo M (ai I)	101	0.006	0.006	0.0241
G.	Off revisit for eval of 28 yo M w onychomycosis (fp B)	29	-0.540	0.012	0.0139
H.	Obtain specimen for KOH slide and interp of tst (fp J)	24	-0.622	0.039	0.0354
M.	C&E of 10 by 12 mm (BCE) of cheek of 60 yo M (ur I)	108	0.033	0.044	0.0261

Table 49 continued

Inputs to and results from the cross-specialty alignment

	Specialty, service, and in parentheses services to which linked	Location scale of work	Location scale of common log of work	e_{ij}	σ_i
	Family Practice (fp)				
*.	Foll-up visit 55yo M, mgmt hypertension, beta/thiazide (im *)	44	-0.359	0.000	...
B.	Off revisit for eval of 28yo M w onychomycosis (dm G)	26	-0.587	-0.034	0.0233
C.	Rep of 2 inch laceration of scalp, 14yo M, off setting (pe P)	79	-0.101	0.061	0.0229
E.	Rigid sigmoidoscopy, wo biopsy, in off (im D)	80	-0.098	0.017	0.0211
J.	Obtain specimen for KOH slide and interp of tst (dm H)	20	-0.703	-0.042	0.0365
K.	Init visit pregnancy 25yo primigravida, hx and exam, etc. (ob C)	126	0.101	0.008	0.0209
M.	Off eval, poss purulent conjunctivitis 16yo F, est pt (im H,pe R)	33	-0.479	0.019	0.0235
N.	Routine gyn exam, 24yo est pt, wo complaints (ob K)	57	-0.244	-0.006	0.0182
O.	Ov 45yo M, est pt, chronic asthma, on chronic steroid, etc. (im I)	59	-0.229	0.016	0.0145
P.	Off eval new onset right lower quad pain in 32yo F, est pt (gs S, im J,ob L,ur J)	94	-0.027	0.003	0.0158
Q.	Off eval 28yo pt regional enteritis, diarrhea, est pt (im L)	81	-0.091	-0.028	0.0154
R.	Sched monthly NH visit to est pt w Organic Brain Syndrome (im P)	51	-0.289	0.016	0.0249
V.	Emerg hosp consult, 72yo, new pt, w poss bowel obstruction (gs W)	160	0.204	0.001	0.0209
W.	Comp well child visit at 6 months, est pt (AAP guidelines) (pe C)	51	-0.295	0.007	0.0184
Y.	1x supervs conf w nurse, antibiotic ther, est pt w SBE (im X)	40	-0.393	-0.023	0.0250
	General Surgery (gs)				
*	Uncomplicated indir inguinal hernia rep, 45yo M	263	0.419	0.000	...
A.	Tot esophagectomy w gastroesophageal anastomosis in chest (ts S)	1803	1.256	0.005	0.0194
B.	Chest tube insertion for spontaneous pneumothorax in 20yo (ts B)	102	0.007	-0.031	0.0256
E.	Tracheostomy, emerg proc, transtracheal, in adlt, etc. (ts R)	275	0.439	-0.033	0.0260
F.	Tonsillectomy and adenoidectomy in 10yo child (ot *)	179	0.254	0.025	0.0300
G.	Low anterior resection for rectal CA (ts H)	1174	1.070	0.007	0.0175
M.	Decompression carpal tunnel, 48yo F, unilat, ambulatory surg (or *)	206	0.313	0.033	0.0229
P.	Comp ov, init eval 48yo M recurrent low back pain to leg (or I)	92	-0.038	-0.028	0.0376
S.	Off eval new onset right lower quad pain in 32yo F, est pt (fp P, im J,ob L,ur J)	81	-0.090	-0.060	0.0416
U.	Hosp visit, 3 days post uncomplicated cholecystectomy, etc. (ur B)	35	-0.452	0.003	0.0443
W.	Emerg hosp consult, 72yo, new pt, poss bowel obstruction (fp V)	158	0.197	-0.006	0.0442
X.	Insertion of Swan-Ganz catheter (an H)	152	0.181	0.026	0.0320

Table 49 continued

Inputs to and results from the cross-specialty alignment

	Specialty, service, and in parentheses services to which linked	Location scale of work	Location scale of common log of work	e_{ij}	σ_i
	Internal Medicine (im)				
*.	Foll-up visit 55yo M, mgmt hypertension, beta/thiazide (fp *)	44	-0.359	0.000	...
A.	Mgmt pt acute pulm edema in ER, subsequently adm hosp, est pt (an U)	230	0.362	-0.001	0.0197
B.	Ov, sore throat, fever, fatigue 19yo college student, est pt (ot B)	35	-0.451	-0.014	0.0244
C.	Aspiration of synovial fluid from knee (or R,rh E)	59	-0.230	0.058	0.0267
D.	Rigid sigmoidoscopy, wo biopsy, in off (fp E)	72	-0.140	-0.025	0.0253
F.	Init off eval, diagnosis and mgmt hematuria, etc. (py *)	99	-0.003	-0.016	0.0205
G.	Emerg hosp consult, 72yo, new pt, w poss bowel obstruction (py L)	187	0.271	-0.032	0.0194
H.	Off eval, poss purulent conjunctivitis 16yo F, est pt (fp M,pe R)	35	-0.462	0.037	0.0232
I.	Ov 45yo M, est pt, chronic asthma, on chronic steroid, etc. (fp O)	55	-0.262	-0.017	0.0151
J.	Off eval new onset right lower quad pain in 32yo F, est pt (fp P, gs S,ob L,ur J)	89	-0.048	-0.018	0.0153
K.	Ov eval recent onset syncopal attacks, 70yo F, est pt (ts N)	126	0.100	0.006	0.0181
L.	Off eval 28yo pt regional enteritis, diarrhea, est pt (fp Q)	95	-0.022	0.041	0.0187
N.	Foll-up hosp visit, day 2, pt non-dominant CVA, etc. (py F)	60	-0.222	0.020	0.0203
P.	Sched monthly NH visit to est pt w Organic Brain Syndrome (fp R)	48	-0.321	-0.017	0.0254
S.	Init eval and mgmt of recurrent urinary tract inf in F (ur O)	68	-0.167	-0.041	0.0225
X.	1x supervs conf w nurse, antibiotic ther, est pt w SBE (fp Y)	45	-0.343	0.028	0.0277
	Obstetrics and Gynecology (ob)				
*.	Diagnostic D&C for menometrorrhagia in 50 yo F (ot D)	101	0.004	0.000	...
A.	Init off eval secondary amenorrhea, 22 yo new pt, etc. (ot I)	112	0.048	0.028	0.0354
C.	Init visit pregnancy 25 yo primigravida, hx and exam, etc. (fp K)	117	0.069	-0.024	0.0356
H.	Protracted labor req pitocin, etc., 1x spent w pt (an K)	439	0.643	-0.049	0.0351
K.	Routine gyn exam, primary care phys, est pt, wo complaints (fp N)	60	-0.219	0.019	0.0315
L.	Off eval new onset right lower quad pain in 32 yo F, est pt (fp P, gs S,im J,ur J)	104	0.015	0.045	0.0349
O.	Laparoscopic tubal sterilization by fulguration in 35 yo (ur Q)	224	0.350	-0.002	0.0231
S.	Perf of amniocentesis at 16 weeks gestation (ts L)	124	0.093	0.029	0.0307

Table 49 continued

Inputs to and results from the cross-specialty alignment

	Specialty, service, and in parentheses services to which linked	Location scale of work	Location scale of common log of work	e_{ij}	σ_i
	Ophthalmology (op)				
*	1x chalazion proc, excision, left upper lid	48	-0.319	0.000	...
A.	Penetrating keratoplasty, cataract extract and IOL implant (ur L)	1220	1.086	0.011	0.0358
B.	Foll-up exam, est pt, incl visual acuity, slit lamp, etc. (ai *)	36	-0.447	-0.052	0.0356
C.	Comp eye exam, adlt pt w no specific complaints, hx, etc. (pe F)	61	-0.216	-0.076	0.0331
E.	Secondary lens implant, wo vitrectomy (ur C)	597	0.776	0.034	0.0322
H.	Diagnostic ultrasonography eye ball w interp, B-Mode, etc. (ra R)	97	-0.015	0.013	0.0245
P.	Interp of fundus photography (pa H)	37	-0.433	0.045	0.0378
Q.	Fluorescein angiography diabetic retinopathy, etc., interp (ra N)	101	0.003	-0.013	0.0254
R.	Endothelial cell count pre-op cataract surg (ur R)	54	-0.265	0.035	0.0308
	Oral and Maxillofacial Surgery (mx)				
*	Expos 1x impact cuspid, off, 14yo future ortho tx, etc.	89	-0.050	0.000	...
A.	LeFort 1 maxill and sagit split mandib osteotomies, etc. (ot A)	1974	1.295	0.063	0.0368
L.	Ov 45yo F smoker w small oral ulcer on lateral border tongue (pa E)	50	-0.297	-0.010	0.0322
O.	Unilat Caldwell-Luc proc, etc., w antral polyp remov (ot T)	332	0.521	-0.018	0.0311
P.	Closed reduction mandib fx by manipulation, etc. (or G)	467	0.669	-0.016	0.0304
	Orthopedic Surgery (or)				
*.	Decompression carpal tunnel, 48yo F, unilat, ambulatory surg (gs M)	190	0.280	0.000	...
G.	Reduction unstable closed comminuted fx distal radius, etc. (mx P)	501	0.700	0.014	0.0288
H.	Comp init off visit for eval 13yo F w progressive scoliosis (pe O)	103	0.011	0.063	0.0430
I.	Comp ov, init eval 48yo man recurrent low back pain to leg (gs P)	107	0.030	0.040	0.0448
K.	Intermed ov, est pt known osteoarthritis and swollen knees (rh N)	54	-0.269	0.033	0.0455
Q.	Interp foot x-rays, poss fx, complete radiograph exam, etc. (rh B)	30	-0.516	0.122	0.0526
R.	Aspiration of synovial fluid from knee, off proc (im C,rh E)	45	-0.343	-0.055	0.0377
S.	Perf and interp a lumbar myelogram, 68yo F (ra S)	158	0.199	-0.038	0.0371

Table 49 continued

Inputs to and results from the cross-specialty alignment

Specialty, service, and in parentheses services to which linked	Location scale of work	Location scale of common log of work	e_{ij}	σ_i
Otolaryngology (ot)				
*. Tonsillectomy and adenoidectomy in 10yo child (gs F)	169	0.229	0.000	...
A. Laryngectomy, w radical neck dissection for cancer in 65yo M (mx A)	1643	1.216	-0.017	0.0189
B. Ov, sore throat, fever, fatigue, 19yo college student, est pt (im B)	39	-0.407	0.029	0.0352
D. Bilateral tympanostomy tube insertion, etc., 2yo, gen anesth (ob *)	104	0.018	0.014	0.0176
E. Diagnostic fiberoptic bronchoscopy, bronchopulm lesion (ts G)	204	0.309	0.004	0.0208
I. Eval recurrent dizziness and vertigo 48yo F, incl hx, etc. (ob A)	97	-0.015	-0.035	0.0399
T. Unilat Caldwell-luc proc, maxill sinus disease, polyp remov (mx O)	351	0.546	0.006	0.0176
Pathology (pa)				
* Exam of a gall bladder removed for cholelithiasis	18	-0.739	0.000	...
E. Exam acid fast stained slide, etc., lesion of lymph node (mx L)	53	-0.277	0.009	0.0308
F. Interp of serum immunoelectrophoresis (ai Q)	28	-0.559	0.009	0.0320
H. Interp peripheral blood smear showing atypical lymphocytes (op P)	31	-0.513	-0.035	0.0329
I. Exam posterior cervical lymph node biopsy, 46yo M, etc. (ra D)	94	-0.029	0.012	0.0295
Pediatrics (pe)				
*. Ov, est pt, 6yo child w sore throat and headache (dm *)	29	-0.536	0.000	...
C. Comp well child visit at 6 months, est pt (AAP Guidelines) (fp W)	49	-0.309	-0.007	0.0178
F. Comp well child visit at 15 years, new pt (AAP Guidelines) (op C)	78	-0.108	0.033	0.0217
I. Off eval head trauma, pre-school child w vomiting, est pt (an L)	70	-0.156	0.016	0.0209
O. Foll-up visit, adolescent w behavior problem, etc., est pt (or H)	86	-0.065	-0.014	0.0203
P. Rep of 2 inch laceration of scalp, 14yo M, off setting (fp C)	62	-0.208	-0.047	0.0200
R. Off eval, poss purulent conjunctivitis 16yo F, est pt (fp N, im H)	29	-0.541	-0.043	0.0204

Table 49 continued

Inputs to and results from the cross-specialty alignment

	Specialty, service, and in parentheses services to which linked	Location scale of work	Location scale of common log of work	e_{ij}	σ_i
	Psychiatry (py)				
*.	2nd ov after referral from internist, 25yo M panic attacks (im F)	103	0.012	0.000	...
D.	Hosp consult, psych eval 68yo surg, post-op depression (rh D)	172	0.237	-0.035	0.0178
F.	Repeat hosp visit stabilized 42yo M, schizophrenia, etc. (im N)	58	-0.240	-0.025	0.0212
L.	Hosp ER eval 78yo F, ingested alcohol and valium, suicide (im G)	197	0.295	0.040	0.0199
N.	Off consult psych eval 65yo M, intellect deterioration, etc. (rh C)	181	0.259	0.018	0.0165
O.	Ov chemother for mgmt of 44yo M w bipolar depression (rh M)	73	-0.139	-0.011	0.0235
S.	Ov diag reeval 68yo F, chronic depression, unresponsive tx (rh H)	144	0.158	-0.006	0.0169
	Radiology (ra)				
*	Upper GI series, air contrast technique, KUB abd pain, etc.	59	-0.227	0.000	...
D.	Barium enema, double contrast, complete proc, occult GI, etc. (pa I)	90	-0.043	-0.003	0.0136
N.	Venography, unilat, complete proc, poss vein thrombosis, etc. (op Q)	107	0.029	0.012	0.0247
P.	Interp bone density study, dual photon absorbtiometry, etc. (rh L)	30	-0.516	0.006	0.0370
R.	Hysterosalpingography, complete proc, 26yo F w infertility (op H)	91	-0.043	-0.014	0.0250
S.	Perf & interp a lumbar myelogram, 68yo F (or S)	178	0.251	0.014	0.0227
T.	Interp of hip x-rays, complete, for moderate/severe hip pain (rh Q)	21	-0.688	-0.009	0.0248
	Rheumatology (rh)				
*.	Foll-up ov, etc., Stage II, Class II, rheumatoid arthritis (ai B)	47	-0.328	0.000	...
B.	Interp x-rays, hands, bilateral, acute rheumatoid arthritis (or Q)	21	-0.683	-0.045	0.0319
C.	Init off eval of 70yo F w polyarthralgia (py N)	163	0.211	-0.031	0.0216
D.	Consult hosp, 35yo F, fever, swelling joints, rash, etc. (py D)	211	0.324	0.054	0.0220
E.	Aspiration of synovial fluid from knee (im C,or R)	47	-0.326	-0.038	0.0300
H.	Init off eval pt, negative lab and x-ray studies, fibrositis (py S)	149	0.173	0.009	0.0220
L.	Interp bone density study, dual photon absorptiometry, etc. (ra P)	30	-0.530	-0.008	0.0405
M.	Foll up off consult, 45yo M ankylosing spondylitis, etc. (py O)	76	-0.120	0.008	0.0206
N.	Ltd ov, est pt known osteoarthritis and painful swollen knees (or K)	49	-0.310	-0.008	0.0225
O.	Comp init eval 48yo M recurrent back pain radiating to leg (ai F)	153	0.186	0.002	0.0197
Q.	Interp of hip x-rays, complete, for moderate/severe hip pain (ra T)	22	-0.665	0.014	0.0300

Table 49 continued

Inputs to and results from the cross-specialty alignment

	Specialty, service, and in parentheses services to which linked	Location scale of work	Location scale of common log of work	e_{ij}	σ_i
	Thoracic Surgery (ts)				
*	Permanent single chamber cardiac pacemaker implantation, etc.	284	0.453	0.000	...
B.	Chest tube insertion for spontaneous pneumothorax, in 20yo (gs B)	116	0.066	0.027	0.0240
G.	Primary diag fiberoptic bronchoscopy, bronchopulm lesion (ot E)	198	0.297	-0.009	0.0321
H.	Left upper pulm lobectomy, for squamous bronchogenic ca (gs G)	1125	1.051	-0.012	0.0227
L.	Thoracentesis, tot evac, effusion and suspected pulm tumor (ob S)	106	0.025	-0.039	0.0353
N.	Init off eval 50yo M w aortic aneurysm, to recommend surg (im K)	113	0.054	-0.039	0.0447
R.	Tracheostomy, emerg proc, transtracheal, in adlt, etc. (gs E)	331	0.519	0.047	0.0311
S.	Tot esophagectomy w gastroesophageal anastomosis in chest (gs A)	1739	1.240	-0.011	0.0280
	Urology (ur)				
*	Diag cystoscopy hosp, ambulatory surg, M w microhematuria	92	-0.034	0.000	...
B.	Foll-up hosp visit 2 days post uncomplicated TURP in 70yo M (gs U)	35	-0.457	-0.003	0.0376
C.	Fulguration and resection medium bladder tumor, 2-5 cm 65yo M (op E)	519	0.716	-0.027	0.0286
I.	Diag cystoscopy, off proc in M w microhematuria (dm M)	95	-0.020	-0.010	0.0123
J.	Init eval and mgmt of recurrent renal calculi in 40yo M (fp P, gs S, im J, ob L)	112	0.048	0.078	0.0355
L.	Percutaneous nephrostolithotomy, 1 stage, 2 cm stone or less (op A)	1167	1.067	-0.009	0.0316
O.	Init eval and mgmt of recurrent urinary tract inf in F (im S)	92	-0.034	0.092	0.0340
Q.	Cystourethroscopy w insertion of indwelling ureteral stent (ob O)	226	0.353	0.001	0.0199
R.	Semen analysis for infertility (op R)	44	-0.360	-0.060	0.0403

Table 50

Positions on common scale of intra-service work: Allergy and Immunology (ai)

Unlogged scale		Logged scale			
Location	Precision: location scale of work	Location	Precision: location scale of work		Service (in parentheses, services to which linked)
40	...	1.605	...	*	Foll-up ov for pharmacological mgmt of 30yo F w hay fever (op B)
151	8.6	2.179	0.0357	A	Intracut, intradermal, tsts insects, immed react, 11-15 tsts
47	8.3	1.671	0.0345	B	OV, est pt, 6yo child w sore throat and headache (rh B)
77	8.5	1.886	0.0354	C	Percutaneous tsts w allergenic extracts (1st 30)
76	8.8	1.882	0.0365	D	Intradermal tsts w allergenic extracts (1st 10)
199	7.6	2.299	0.0319	E	Dir hosp adm, yng adlt pt, failed prev ther, asthmtic attack
152	7.6	2.181	0.0320	F	Init ov for eval of child w chronic wheezing (rh O)
19	11.1	1.272	0.0456	G	1x inj for immunother, antigen supp by another source
37	9.0	1.571	0.0375	H	Interp of pulm function tsts, interp results, FVC, FEV, FEF
100	14.2	1.998	0.0578	I	Fibroscopic exam nasal, choanal, pharynx for nasal polyps (dm A)
156	12.4	2.192	0.0506	J	Inhalation bronchial challenge tstg w histamine, etc
72	10.0	1.860	0.0413	K	Prof svcs for supervs and prov antigens, allergen immunother
162	7.6	2.210	0.0318	L	Eval of 6yo M w mult infs, new pt
63	9.1	1.803	0.0379	M	A&R of intradermal tsts w antigens, immune deficiency eval
158	7.9	2.200	0.0329	N	Init off eval of adlt w chronic recurrent hives, new pt
86	7.5	1.932	0.0315	O	OV 45yo M, est pt, chronic asthma, on chronic steroid, etc
104	8.0	2.019	0.0333	P	Med conf w pt. and/or family, counseling for avoidance, etc (an V)
26	11.2	1.421	0.0460	Q	Interp of serum immunoelectrophoresis (pa F)
205	8.0	2.313	0.0336	R	Dir hosp adm of 62yo smoker, est pt, respiratory distress

Table 50 continued

Positions on common scale of intra-service work: Anesthesiology (an)

Unlogged scale		Logged scale			
Location	Precision: location scale of work	Location	Precision: location scale of work	Service (in parentheses, services to which linked)	
96	...	1.980	...	*	Anesth for inguinal hernia rep
615	7.5	2.789	0.0316	A	Anesth for CABG w pump oxygenator
73	7.6	1.863	0.0318	B	Anesth for cystoscopy
256	6.8	2.408	0.0285	C	Anesth for colectomy
299	6.9	2.476	0.0290	D	Anesth for femoral-popliteal bypass
127	7.0	2.105	0.0294	E	Anesth for laparoscopic tubal ligation
201	6.6	2.304	0.0276	F	Anesth for cholecystectomy
292	6.9	2.465	0.0289	G	Anesth for total hip replmnt
136	8.7	2.135	0.0362	H	Insertion of Swan Ganz catheter (gs X)
105	6.3	2.021	0.0265	I	Anesth for knee arthroscopy
232	6.7	2.366	0.0281	J	Anesth for open reduction and int fixation hip fx
509	7.1	2.707	0.0299	K	Anesth for rep of AAA (ob H)
65	7.0	1.815	0.0294	L	Anesth for D&C of uterus (pe I)
147	7.9	2.167	0.0331	M	Anesth for lens surgery, cataract extraction, etc
167	8.4	2.222	0.0349	N	Eval 63yo pt, ICU w diabetes and chronic renal failure, etc
173	6.7	2.237	0.0280	O	Anesth for transurethral resection of prostate
340	6.9	2.532	0.0290	P	Anesth for carotid endarterectomy
101	6.6	2.006	0.0278	Q	Regional IV anesth for upper extremity op
126	7.5	2.100	0.0316	R	Inj of anesthetic substance, therapeutic, 1x, epidural block
176	6.6	2.247	0.0278	S	Anesth for modified radical mastectomy
435	7.3	2.638	0.0308	T	Anesth for craniectomy or craniotomy
231	6.9	2.364	0.0289	U	Anesth for cesarean section (im A)
111	8.1	2.047	0.0340	V	Consult for transfusion react in pt w fever and back pain (ai P)

Table 50 continued

Positions on common scale of intra-service work: Dermatology (dm)

Unlogged scale		Logged scale			
Location	Precision: location scale of work	Location	Precision: location scale of work		Service (in parentheses, services to which linked)
29	...	1.464	...	*	Foll-up visit w 48yo M ongoing mgmt psoriasis not PUVA tx (pe *)
101	6.9	2.006	0.0288	A	Excision changing pigmnted lesion back, 6x4 mm, 52yo M (ai I)
41	7.7	1.618	0.0322	B	Cryodest mult, 3 to 4, facial actinic keratoses, 65yo farmer
66	5.8	1.817	0.0243	C	Init ov, eval and counseling 17yo F w primary genital herpes
33	8.8	1.516	0.0365	D	Obtain specimen Tzanck Smear and interp of tst
59	5.8	1.768	0.0246	E	Init ov, 35yo M w complaint of alopecia
24	8.1	1.374	0.0338	F	Intralesional inj, triamcinolone
29	5.0	1.460	0.0212	G	Off revisit for eval of 28yo M w onychomycosis (fp B)
24	9.3	1.378	0.0386	H	Obtain specimen for KOH slide and interp of tst (fp J)
65	11.9	1.813	0.0487	I	Off revisit w est 63yo pt, laser tx hemangioma
62	5.6	1.794	0.0238	J	Init ov, 16yo M w severe cystic acne, new pt
32	8.8	1.498	0.0367	K	Photochemother (PUVA), scheduled tx during ther
58	5.9	1.762	0.0250	L	Shave/punch biopsy probable skin cancer
108	7.3	2.033	0.0305	M	C&E of 10 by 12 mm (BCE) of cheek of 60yo M (ur I)
155	7.4	2.191	0.0309	N	Excision & intermed rep of 4 by 6 mm BCE of forehead 30yo F
40	7.2	1.602	0.0303	O	Liquid nitrogen cryodestruction 3 verrucae hands of 14yo M
98	6.4	1.991	0.0270	P	Hosp consult, poss drug eruption, 50yo M
53	14.5	1.725	0.0589	Q	X-ray ther, BCE tip of nose 65yo F, 1x tx, not entire course
75	6.2	1.875	0.0261	R	Init off eval, adlt w chronic recurrent hives, new pt
66	9.9	1.818	0.0409	S	Path gross and micro exam, melanocytic lesion, 26yo F
87	5.9	1.938	0.0247	T	Init comp eval 30yo F w symptoms of SCLE
105	7.4	2.022	0.0310	U	Excision of 2 facial nevi, 20yo M, 8 and 4 mms respectively

Table 50 continued

Positions on common scale of intra-service work: Family Practice (fp)

Unlogged scale		Logged scale			
Location	Precision: location scale of work	Location	Precision: location scale of work		Service (in parentheses, services to which linked)
44	...	1.641	...	*	Foll-up visit 55yo M, mgmt hypertension, beta/thiazide (im *)
151	5.1	2.180	0.0218	A	Dir hosp adm yng adlt est pt, acute asthma attack
26	6.1	1.413	0.0256	B	Off revisit for eval of 28yo M w onychomycosis (dm G)
79	6.0	1.899	0.0253	C	Rep of 2 inch laceration of scalp, 14yo M, off setting (pe P)
234	11.3	2.369	0.0465	D	Appendectomy, acute abdomen w unperforated appendicitis
80	6.1	1.902	0.0256	E	Rigid sigmoidoscopy, wo biopsy, in off (im D)
77	6.1	1.885	0.0257	F	Incision & drainage of peri-anal abscess, off proc
366	13.0	2.563	0.0532	G	Abdominal hysterectomy, cancer in situ of cervix, 50yo F
251	9.8	2.399	0.0407	H	Uncomplicated spontaneous vaginal delivery
15	8.2	1.188	0.0344	I	Urinalysis w micro exam, off lab, supervs, excl collection
20	9.0	1.297	0.0375	J	Obtain specimen for KOH slide and interp of tst (dm H)
126	6.2	2.101	0.0262	K	Init visit pregnancy 25yo primigravida, hx and exam, etc. (ob C)
39	5.4	1.590	0.0227	L	Ov, est pt, 6yo child w sore throat and headache
33	6.1	1.521	0.0256	M	Off eval, poss purulent conjunctivitis 16yo F, est pt (im H, pe R)
57	5.1	1.756	0.0214	N	Routine gyn exam, 24yo est pt, wo complaints (ob K)
59	4.4	1.771	0.0187	O	Ov 45yo M, est pt, chronic asthma, on chronic steroid, etc. (im I)
94	4.6	1.973	0.0196	P	Off eval new onset right lower quad pain in 32yo F, est pt (gs S, im J,ob L,ur J)
81	4.5	1.909	0.0193	Q	Off eval 28yo pt regional enteritis, diarrhea, est pt (im L)
51	6.5	1.711	0.0273	R	Sched monthly NH visit to est pt w Organic Brain Syndrome (im P)
100	5.4	2.002	0.0228	S	NH visit, unsched, eval pt w fever and obtundation, etc.
174	5.4	2.239	0.0230	T	Mgmt pt acute pulm edema in ER, subsequent hosp adm, est pt
132	5.2	2.120	0.0220	U	Off consult psych exam 25yo M, intellect deterioration, etc.
160	5.7	2.204	0.0239	V	Emerg hosp consult, 72yo, new pt, w poss bowel obstruction (gs W)
51	5.1	1.705	0.0216	W	Comp well child visit at 6 months, est pt (AAP guidelines) (pe C)
49	7.4	1.694	0.0312	X	Phone consult, pt home, 1:30 A.M., belching, etc.
40	6.6	1.607	0.0278	Y	1x supervs conf w nurse, antibiotic ther, est pt w SBE (im X)

Table 50 continued

Positions on common scale of intra-service work: General Surgery (gs)

Unlogged scale		Logged scale		
Location	Precision: location scale of work	Location	Precision: location scale of work	Service (in parentheses, services to which linked)
263	...	2.419	...	* Uncomplicated indir inguinal hernia rep, 45yo M
1803	7.5	3.256	0.0315	A Tot esophagectomy w gastroesophageal anastomosis in chest (ts S)
102	8.1	2.007	0.0337	B Chest tube insertion for spontaneous pneumothorax in 20yo (ts B)
79	12.2	1.900	0.0501	C Regional IV anesth, upper extremity op, surg by other
768	6.8	2.886	0.0285	D Modified radical mastectomy
275	8.1	2.439	0.0340	E Tracheostomy, emerg proc, transtracheal, in adlt, etc. ((ts R)
179	13.3	2.254	0.0544	F Tonsillectomy and adenoidectomy in 10yo child (ot *)
1174	6.6	3.070	0.0277	G Low anterior resection for rectal CA (ts H)
326	6.2	2.513	0.0260	H Appendectomy, acute abd w unperforated appendicitis
61	8.6	1.784	0.0358	I Rigid sigmoidoscopy, wo biopsy, in off
339	10.7	2.530	0.0443	J Colonoscopy and polypectomy, 53yo M, etc., outpt
607	6.5	2.783	0.0274	K Cholecystectomy for cholelithiasis
669	7.1	2.825	0.0298	L Abdominal hysterectomy, cancer in situ of cervix, 50yo F
206	8.8	2.313	0.0365	M Decompression carpal tunnel, 48yo F, unilat, ambulatory surg (or *)
141	11.0	2.150	0.0455	N Excision 0.5 cm basal cell CA, outer 1/3 lower eyelid
124	12.6	2.092	0.0514	O Preoperative eval new pt w primary hyperparathyroidism
92	12.1	1.962	0.0496	P Comp ov, init eval 48yo M recurrent low back pain to leg (or I)
37	11.3	1.569	0.0464	Q Foll-up ov, 60yo est pt 8 weeks post partial colectomy, etc.
44	12.0	1.644	0.0491	R Foll-up visit, post tx, pt w primary breast cancer
81	11.3	1.910	0.0464	S Off eval new onset right lower quad pain in 32yo F, est pt (fp P,im J,ob L,ur J)
107	11.0	2.029	0.0452	T Hosp adm, 45yo F w acute cholecystitis
35	11.9	1.548	0.0490	U Hosp visit, 3 days post uncomplicated cholecystectomy, etc. (ur B)
279	12.8	2.445	0.0525	V Init eval mgmt mult trauma pt w complex pelvic fx, 35yo M
158	11.8	2.197	0.0485	W Emerg hosp consult, 72yo, new pt, poss bowel obstruction (fp V)
152	10.4	2.181	0.0431	X Insertion of Swan-Ganz catheter (an H)
340	13.2	2.531	0.0538	Y Triage, resus and hosp adm from ER, 52yo, alcoholic, etc.

Table 50 continued

Positions on common scale of intra-service work: Internal Medicine (im)

Unlogged scale		Logged scale			
Location	Precision: location scale of work	Location	Precision: location scale of work		Service (in parentheses, services to which linked)
44	...	1.641	...	*	Foll-up visit 55yo M, mgmt hypertension, beta/thiazide (fp *)
230	5.5	2.362	0.0232	A	Mgmt pt acute pulm edema in ER, subsequently adm hosp, est pt (an U)
35	6.5	1.549	0.0272	B	Ov, sore throat, fever, fatigue 19yo college student, est pt (ot B)
59	7.3	1.770	0.0304	C	Aspiration of synovial fluid from knee (or R,rh E)
72	7.1	1.860	0.0296	D	Rigid sigmoidoscopy, wo biopsy, in off (fp E)
15	8.1	1.187	0.0338	E	Urinalysis w micro exam, off lab, supervs, excl collection
99	5.7	1.997	0.0242	F	Init off eval, diagnosis and mgmt hematuria, etc. (py *)
187	5.4	2.271	0.0230	G	Emerg hosp consult, 72yo, new pt, w poss bowel obstruction (py L)
35	6.2	1.538	0.0263	H	Off eval, poss purulent conjunctivitis 16yo F, est pt (fp M,pe R)
55	4.6	1.738	0.0195	I	Ov 45yo M, est pt, chronic asthma, on chronic steroid, etc. (fp O)
89	4.6	1.952	0.0197	J	Off eval new onset right lower quad pain in 32yo F, est pt (fp P, gs S,ob L,ur J)
126	5.1	2.100	0.0218	K	Ov eval recent onset syncopal attacks, 70yo F, est pt (ts N)
95	5.3	1.978	0.0225	L	Off eval 28yo pt regional enteritis, diarrhea, est pt (fp Q)
154	5.8	2.187	0.0244	M	Dir hosp adm of 62yo smoker, est pt, respiratory distress
60	5.6	1.778	0.0238	N	Foll-up hosp visit, day 2, pt non-dominant CVA, etc. (py F)
70	5.6	1.846	0.0238	O	Hosp visit, day 3 post adm, 65yo M uncomplicated MI, est pt
48	6.9	1.679	0.0291	P	Sched monthly NH visit to est pt w Organic Brain Syndrome (fp R)
118	5.6	2.071	0.0235	Q	NH visit, unsched, for eval pt w fever and obtundation, etc.
146	5.5	2.163	0.0232	R	Hosp consult for diagnosis/mgmt of fever foll abdominal surg
68	6.1	1.833	0.0256	S	Init eval and mgmt of recurrent urinary tract inf in F (ur O)
72	7.0	1.856	0.0294	T	Init off eval of a 37 generally well M
28	7.5	1.454	0.0314	U	ECG w interp in a 50yo M
28	7.0	1.450	0.0293	V	Off phone consult re: poss adverse drug react in est pt
66	7.3	1.821	0.0308	W	Phone consult pt home, 1:30 A.M., belching, etc.
45	7.4	1.657	0.0310	X	1x supervs conf w nurse, antibiotic ther, est pt w SBE (fp Y)

Table 50 continued

Positions on common scale of intra-service work: Obstetrics and Gynecology (ob)

Unlogged scale		Logged scale			
Location	Precision: location scale of work	Location	Precision: location scale of work		Service (in parentheses, services to which linked)
101	...	2.004	...	*	Diagnostic D&C for menometrorrhagia in 50 yo F (ot D)
112	10.5	2.048	0.0432	A	Init off eval secondary amenorrhea, 22 yo new pt, etc. (ot I)
38	10.3	1.580	0.0424	B	Limited prenatal foll-up visit, hx and exam, etc.
117	10.5	2.069	0.0432	C	Init visit pregnancy 25 yo primigravida, hx and exam, etc. (fp K)
73	11.0	1.864	0.0452	D	Ext foll-up prenatal visit at 36-37 weeks, etc.
232	10.5	2.366	0.0432	E	Normal uncomplicated labor, multipara, no risk, 1x w pt
363	9.8	2.560	0.0406	F	Labor, moderate hypertension, etc., 1x spent w pt
324	10.5	2.511	0.0434	G	Preterm labor, req tocolysis, etc., 1x spent w pt
439	10.5	2.643	0.0433	H	Protracted labor req pitocin, etc., 1x spent w pt (an K)
307	7.3	2.487	0.0305	I	Ovarian cystectomy, unilateral, uncomplicated, in 25 yo
504	7.9	2.702	0.0331	J	Abdominal hysterectomy, cancer in situ of cervix, 50 yo
60	9.5	1.781	0.0396	K	Routine gyn exam, primary care phys, est pt, wo complaints (fp N)
104	10.3	2.015	0.0427	L	Off eval new onset right lower quad pain in 32 yo F, est pt (fp P, gs S, im J, ur J)
241	8.6	2.381	0.0359	M	Uncomplicated spontaneous vaginal delivery
120	9.0	2.078	0.0376	N	Colposcopy abnorm cervical cytology, Pap smear, w biopsy
224	7.9	2.350	0.0332	O	Laparoscopic tubal sterilization by fulguration in 35 yo (ur Q)
50	9.4	1.696	0.0392	P	Ov postpartum care 6 weeks, uncomplicated vaginal delivery
367	8.6	2.565	0.0358	Q	Uncomplicated cesarean delivery, cephalopelvic disproportion
152	11.8	2.181	0.0486	R	Fetal ultrasound poss fetal abnorm, B-scan w image doc
124	10.4	2.093	0.0428	S	Perf of amniocentesis at 16 weeks gestation (ts L)
41	10.2	1.611	0.0422	T	Interp of fetal non stress tst
89	10.1	1.951	0.0416	U	Init ov eval and counseling 17 yo F w primary genital herpes
545	8.4	2.736	0.0350	V	Vaginal hysterectomy, anterior and posterior colporrhaphy
152	9.2	2.183	0.0382	W	Elective term 1st trimester pregnancy, evac and curettage
146	10.4	2.165	0.0431	X	Init ov 34 year pt w primary infertility, incl counseling
186	11.4	2.269	0.0470	Y	Intracavitary radioelement app, pt w cervical cancer, etc.
109	10.9	2.038	0.0451	Z	Ov counseling 25yo primigravida, family hx of Downs Syndrome

Table 50 continued

Positions on common scale of intra-service work: Ophthalmology (op)

Unlogged scale		Logged scale			
Location	Precision: location scale of work	Location	Precision: location scale of work	Service (in parentheses, services to which linked)	
48	...	1.681	...	*	1x chalazion proc, excision, left upper lid
1220	12.2	3.086	0.0498	A	Penetrating keratoplasty, cataract extract and IOL implant (ur L)
36	10.7	1.553	0.0443	B	Foll-up exam, est pt, incl visual acuity, slit lamp, etc. (ai *)
61	10.3	1.784	0.0424	C	Comp eye exam, adlt pt w no specific complaints, hx, etc. (pe F)
108	9.8	2.034	0.0408	D	Consult/ext eval complex ophthalmic problem, etc.
597	10.3	2.776	0.0424	E	Secondary lens implant, wo vitrectomy (ur C)
41	10.8	1.615	0.0445	F	Interp formal visual fields tsts, neuro purposes, adlt
70	9.7	1.843	0.0402	G	IOL calculation, biometry/keratometry, A-mode
97	9.3	1.985	0.0386	H	Diagnostic ultrasonography eye ball w interp, B-Mode, etc. (ra R)
443	9.6	2.646	0.0399	I	Lid surg, two-lid blepharoplasty, both upper lids
846	10.9	2.927	0.0451	J	Extracapsular cataract extract w IOL
532	9.3	2.726	0.0385	K	Commitant strabismus surg, primary, etc., in a child
680	10.0	2.832	0.0413	L	Glaucoma filtering proc, primary, trabeculotomy
1028	11.9	3.012	0.0488	M	Scleral buckle, wo vitrectomy, primary
532	13.3	2.726	0.0544	N	Panretinal photocoagulation, tot tx, one eye, etc.
116	9.9	2.063	0.0409	O	Contact lens eval and fitting, incl comp eye exam, etc.
37	11.8	1.567	0.0483	P	Interp of fundus photography (pa H)
101	9.4	2.003	0.0392	Q	Fluorescein angiography diabetic retinopathy, etc., interp (ra N)
54	11.7	1.735	0.0480	R	Endothelial cell count pre-op cataract surg (ur R)
31	10.5	1.493	0.0434	S	Off eval poss purulent conjunctivitis 16yo F, est pt
512	17.8	2.709	0.0711	T	Refractive surg, radial keratotomy
317	10.7	2.501	0.0440	U	Excision of 0.5 cm basal cell CA, outer 1/3 lower eyelid

Table 50 continued

Positions on common scale of intra-service work: Oral and Maxillofacial Surgery (mx)

Unlogged scale		Logged scale			
Location	Precision: location scale of work	Location	Precision: location scale of work		Service (in parentheses, services to which linked)
89	...	1.950	...	*	Expos 1x impact cuspid, off, 14yo future ortho tx, etc.
1974	12.2	3.295	0.0498	A	LeFort 1 maxill and sagit split mandib osteotomies, etc. (ot A)
26	10.7	1.419	0.0443	B	Ov to advise remov wisdom teeth, 18yo M, etc.
287	10.0	2.458	0.0413	C	Remov 4 impact (full bony) wisdom teeth, 1x off proc, 21yo M
342	10.0	2.534	0.0415	D	Remov 4 impact (full bony) wisdom teeth, 1x hosp proc, 21yo M
125	10.7	2.096	0.0440	E	Gen anesth 14yo child, expos 1 impacted cuspid, off setting
93	12.2	1.969	0.0499	F	Gen anesth extract abscessed tooth in healthy 40yo M
213	10.8	2.328	0.0445	G	Extract 10 erupted mandib teeth, 60yo M on Persantine, etc.
51	10.7	1.710	0.0442	H	Extract of abscessed tooth in a healthy 40yo M
1176	11.8	3.070	0.0486	I	Bilat sagitt osteotomy, mandib ramus 20yo F, etc.
73	10.3	1.860	0.0427	J	Excision of 0.5 cm benign lesion of the lip in a 60yo F
134	12.2	2.127	0.0498	K	Comp eval 28yo F, 2 year hx facial/TMJ pain, etc.
50	11.4	1.703	0.0467	L	Ov 45yo F smoker w small oral ulcer on lateral border tongue (pa E)
147	11.5	2.167	0.0473	M	Gen anesth, off extract 4 wisdom teeth healthy 18yo M, etc.
130	12.2	2.113	0.0499	N	Gen anesth for extract of fx tooth in 4yo child
332	11.4	2.521	0.0470	O	Unilat Caldwell-Luc proc, etc., w antral polyp remov (ot T)
467	11.0	2.669	0.0455	P	Closed reduction mandib fx by manipulation, etc. (or G)
955	11.4	2.980	0.0470	Q	Open surgical tx, complex mandib fx, etc.
26	11.0	1.417	0.0453	R	Interp panoramic x-rays remov impacted wisdom teeth, etc.
74	12.3	1.868	0.0502	S	Perf and interp bilat Xray TMJ, open and closed, etc.
908	11.8	2.958	0.0483	T	Open tx, mult fx zygomatic arch and malar tripod, etc.
615	14.3	2.789	0.0579	U	Unilat arthroscopy of temperomandibular joint
639	12.6	2.806	0.0514	V	Placement of 4 maxill endosseous implants
1056	12.5	3.023	0.0512	W	Unilat meniscoplasty, temporomandibular joint

Table 50 continued

Positions on common scale of intra-service work: Orthopedic Surgery (or)

Unlogged scale		Logged scale			
Location	Precision: location scale of work	Location	Precision: location scale of work		Service (in parentheses, services to which linked)
190	...	2.280	...	*	Decompression carpal tunnel, 48yo F, unilat, ambulatory surg (gs M)
1486	7.8	3.172	0.0327	A	Primary tot hip replacement for osteoarthritis
48	13.1	1.678	0.0536	B	Day 3 or 4 post-op foll-up, 80yo F, rep intertrochanteric fx
365	7.7	2.562	0.0323	C	Bunionectomy, Keller/McBride/Mayo type, 45yo F, etc.
557	8.1	2.746	0.0338	D	Arthroscopic partial menisectomy, 22yo M, knee trauma, etc.
1074	9.2	3.031	0.0383	E	Unilat lumbar laminectomy, excision intervertebral disc, etc.
881	8.4	2.945	0.0349	F	Open reduction and int fixation, intertrochanteric fx 80yo F
501	9.1	2.700	0.0378	G	Reduction unstable closed comminuted fx distal radius, etc. (mx P)
103	12.1	2.011	0.0497	H	Comp init off visit for eval 13yo F w progressive scoliosis (pe O)
107	12.3	2.030	0.0503	I	Comp ov, init eval 48yo man recurrent low back pain to leg (gs P)
290	14.5	2.462	0.0587	J	Init eval, mgmt mult trauma pt, complex pelvic fx, 35yo M
54	12.3	1.731	0.0505	K	Intermed ov, est pt known osteoarthritis and swollen knees (rh N)
36	14.2	1.552	0.0578	L	Interp lumbar spine X-rays, complete radiograph exam, etc.
73	11.7	1.862	0.0481	M	Closed reduction, subluxation head radius, 4yo M, off setting
69	11.6	1.838	0.0476	N	1st visit eval and counseling 28yo M runner, knee/calf pain
42	15.2	1.625	0.0613	O	Interp x-rays, tx comminuted fx distal radius, 3 views, etc.
29	13.9	1.456	0.0566	P	Interp elbow x-rays: complete radiograph exam, for pain, etc.
30	13.9	1.484	0.0567	Q	Interp foot x-rays, poss fx, complete radiograph exam, etc. (rh B)
45	10.6	1.657	0.0439	R	Aspiration of synovial fluid from knee, off proc (im C,rh E)
158	12.5	2.199	0.0512	S	Perf and interp a lumbar myelogram, 68yo F (ra S)
1435	9.7	3.157	0.0402	T	Laminectomy, decompression spinal cord, cauda equina, etc.
34	13.5	1.532	0.0550	U	Interp hip x-rays, complete, for moderate/severe hip pain

Table 50 continued

Positions on common scale of intra-service work: Otolaryngology (ot)

Unlogged scale		Logged scale			
Location	Precision: location scale of work	Location	Precision: location scale of work		Service (in parentheses, services to which linked)
169	...	2.229	...	*	Tonsillectomy and adenoidectomy in 10yo child (gs F)
1643	7.2	3.216	0.0300	A	Laryngectomy, w radical neck dissection for cancer in 65yo M (mx A)
39	10.0	1.593	0.0415	B	Ov, sore throat, fever, fatigue, 19yo college student, est pt (imB)
72	9.6	1.856	0.0399	C	Init off eval gradual hearing loss, 58yo M, hx, etc.
104	6.8	2.018	0.0287	D	Bilateral tympanostomy tube insertion, etc., 2yo, gen anesth (ob *)
204	7.7	2.309	0.0323	E	Diagnostic fiberoptic bronchoscopy, bronchopulm lesion (ts G)
764	7.7	2.883	0.0323	F	Septorhinoplasty, primary rhinoplasty septal rep, 25yo M
212	7.1	2.327	0.0299	G	Dir laryngoscopy w biopsy, suspected CA, 50yo M, gen anesth
1070	7.0	3.029	0.0294	H	Tympanoplasty w mastoidectomy for cholesteatoma in adlt
97	11.0	1.985	0.0452	I	Eval recurrent dizziness and vertigo 48yo F, incl hx, etc. (ob A)
31	10.7	1.492	0.0442	J	Interp of audiometry, basic, comp
47	11.9	1.672	0.0487	K	Interp of spontaneous nystagmus tst, w recording (ENG)
1102	7.4	3.042	0.0310	L	Parotidectomy, lateral lobe, dissection, etc.
397	8.7	2.598	0.0362	M	Tracheostomy, emerg proc, transtracheal, adlt, etc.
77	11.0	1.884	0.0452	N	Eval hoarseness and dysphagia, 65yo M incl hx and physical
416	7.7	2.619	0.0322	O	Uvulopalatal pharyngoplasty, upper airway obstruction
1176	14.7	3.070	0.0597	P	Cochlear implant, child, bilat sensorineural hearing loss
1965	10.2	3.293	0.0422	Q	Acoustic neuroma resection in adlt, translabyrinthine
155	7.5	2.191	0.0313	R	Closed reduction nasal fx, stabilization, post trauma 20yo M
93	12.3	1.971	0.0503	S	Rhinoplasty eval, 25yo F, incl hx, physical, etc.
351	6.9	2.546	0.0288	T	Unilat Caldwell-luc proc, maxill sinus disease, polyp remov (mx O)
64	9.0	1.806	0.0376	U	Remov of foreign body from ear canal wo gen anesth

Table 50 continued

Positions on common scale of intra-service work: Pathology (pa)

Unlogged scale		Logged scale		
Location	Precision: location scale of work	Location	Precision: location scale of work	Service (in parentheses, services to which linked)
18	...	1.261	...	* Exam of a gall bladder removed for cholelithiasis
195	11.9	2.290	0.0490	A Exam of a tot laryngectomy etc., CA of larynx, etc.
9	10.9	0.944	0.0450	B Exam two segments vas deferentia, etc., to induce sterility
97	12.1	1.988	0.0495	C Exam frozen section breast biopsy, 2-3 cm, 34yo F, etc.
53	11.4	1.723	0.0470	E Exam acid fast stained slide, etc., lesion of lymph node (mx L)
28	12.2	1.441	0.0501	F Interp of serum immunoelectrophoresis (ai Q)
59	11.6	1.769	0.0476	G Cytologic exam of a bronchial aspirate
31	11.9	1.487	0.0488	H Interp peripheral blood smear showing atypical lymphocytes (op P)
94	11.2	1.971	0.0463	I Exam posterior cervical lymph node biopsy, 46yo M, etc. (ra D)
95	11.1	1.977	0.0458	J Interp of fine needle aspirate of the prostate, 10 smears
88	12.0	1.945	0.0493	K Consult in an intrapartum bleeding diathesis
66	11.2	1.822	0.0462	L Exam mult endoscopically remov biopsies, etc., pt w colitis
94	11.1	1.972	0.0459	M Exam hysterectomy and salpingo-oophorectomy, 57yo F, etc.
74	12.0	1.866	0.0493	N Consult for transfusion react in pt w fever and back pain
90	11.8	1.953	0.0486	O Exam of a changing melanocytic lesion in a 26yo F
26	13.8	1.415	0.0562	P Interp of L/S ratio for fetal maturity
51	11.1	1.708	0.0458	Q Exam of D&C for bleeding in a postmenopausal F
26	11.5	1.417	0.0473	R Clinical path consult, ltd-crystal analysis synovial fluid

Table 50 continued

Positions on common scale of intra-service work: Pediatrics (pe)

Unlogged scale		Logged scale		
Location	Precision: location scale of work	Location	Precision: location scale of work	Service (in parentheses, services to which linked)
29	...	1.464	...	* Ov, est pt, 6yo child w sore throat and headache (dm *)
167	8.1	2.223	0.0339	A Attendance in delivery room w resus of 2000 gram infant
16	6.0	1.207	0.0255	B Off eval of diaper dermatitis, est pt
49	5.7	1.691	0.0239	C Comp well child visit at 6 months, est pt (AAP Guidelines) (fp W)
54	5.8	1.735	0.0246	D Comp well child visit at 2 years, est pt (AAP Guidelines)
68	6.1	1.835	0.0257	E Comp well child visit at 5 years, new pt (AAP Guidelines)
78	6.4	1.892	0.0270	F Comp well child visit at 15 years, new pt (AAP Guidelines) (op C)
126	6.4	2.099	0.0270	G Hosp adm for 18 month old child w 10% dehydration
91	6.1	1.959	0.0256	H Init visit of adolescent F w abd pain, new pt
70	6.2	1.844	0.0263	I Off eval head trauma, pre-school child w vomiting, est pt (an L)
31	9.2	1.495	0.0381	J 2:00 A.M. phone call for crying child under 12 months
92	8.1	1.965	0.0337	K Intubation of newborn
113	6.6	2.052	0.0277	L Poss of sexual abuse in 5yo F, new pt
37	7.9	1.565	0.0330	M Closed reduction, subluxation, head of radius at elbow, 4yo M
78	7.4	1.892	0.0309	N Lumbar puncture of 5yo for suspected meningitis
86	6.2	1.935	0.0260	O Foll-up visit, adolescent w behavior problem, etc., est pt (or H)
62	6.3	1.792	0.0265	P Rep of 2 inch laceration of scalp, 14yo M, off setting (fp C)
18	7.9	1.265	0.0332	Q Urinalysis w micro exam, off lab, excl collection
29	6.1	1.459	0.0259	R Off eval, poss purulent conjunctivitis 16yo F, est pt (fp N, im H)
76	5.8	1.881	0.0243	S Init ov for eval of child w chronic wheezing
17	7.1	1.242	0.0297	T Phone call during off hours for child w rash on Amoxicillin
45	7.1	1.656	0.0296	U Remov of foreign body from ear canal wo gen anesth

Table 50 continued

Positions on common scale of intra-service work: Psychiatry (py)

Unlogged scale		Logged scale			
Location	Precision: location scale of work	Location	Precision: location scale of work		Service (in parentheses, services to which linked)
103	...	2.012	...	*	2nd ov after referral from internist, 25yo M panic attacks (im F)
300	7.1	2.478	0.0299	A	ER eval, intervention 25yo M, voices, attempt stab, etc.
56	9.2	1.750	0.0383	B	Phone conv, retarded mother of 18yo schizophrenic M, etc.
102	5.0	2.009	0.0212	C	Foll-up psychother ov, 48yo housewife for tx of agoraphobia
172	6.1	2.237	0.0258	D	Hosp consult, psych eval 68yo surg, post-op depression (rh D)
135	7.3	2.130	0.0308	E	Eval records and reports, 69yo F, pre-syncopal episodes, etc.
58	6.8	1.760	0.0284	F	Repeat hosp visit stabilized 42yo M, schizophrenia, etc. (im N)
114	6.0	2.057	0.0255	G	Ov, term 66yo business executive 2x weekly psychother, etc.
100	5.7	1.999	0.0242	H	Weekly med psychother and pharmacother ov, 36yo F, etc.
149	6.0	2.173	0.0253	I	Family psychother, husband of 28yo F, bipolar illness, etc.
191	6.8	2.281	0.0284	J	Mult family group med psychother of families, in-pts, etc.
160	6.0	2.203	0.0253	K	Group med psychother in-off, 6 pts seen weekly, etc.
197	6.5	2.295	0.0274	L	Hosp ER eval 78yo F, ingested alcohol and valium, suicide (im G)
183	6.0	2.261	0.0253	M	Ov diag interview & eval 17yo M, personality change, etc.
181	5.9	2.259	0.0250	N	Off consult psych eval 65yo M, intellect deterioration, etc. (rh C)
73	7.2	1.861	0.0301	O	Ov chemother for mgmt of 44yo M w bipolar depression (rh M)
108	12.9	2.035	0.0527	P	Electroconvulsive ther, 1x seizure, 82yo widowed M hosp, etc.
378	6.7	2.577	0.0280	Q	Eval 24yo M, murder, competency to stand trial, etc.
152	6.9	2.182	0.0291	R	1x supervisory conf, team RNs, SWs, andn MHWs, psych unit
144	6.0	2.158	0.0253	S	Ov diag reeval 68yo F, chronic depression, unresponsive tx (rh H)
197	6.4	2.293	0.0271	T	Ov family psychother, 38yo father incestuous w 12yo daughter
125	6.1	2.097	0.0256	U	Ov individ psychoanalysis 42yo, passive-aggressive, etc.
283	7.1	2.452	0.0296	V	Court-requested eval juvenile, attempted rape a 71yo F, etc.
178	6.4	2.252	0.0269	W	Eval & level care decision 17yo adolescent, schizo, etc.
135	8.3	2.131	0.0346	X	Prep report to DMH halfway house coord, 3-week hosp, etc.

Table 50 continued

Positions on common scale of intra-service work: Radiology (ra)

Unlogged scale		Logged scale			
Location	Precision: location scale of work	Location	Precision: location scale of work	Service (in parentheses, services to which linked)	
59	...	1.773	...	*	Upper GI series, air contrast technique, KUB abd pain, etc.
463	8.4	2.665	0.0349	A	Cervicocerebral angiography, selective catheter, etc.
18	8.4	1.258	0.0351	B	Interp chest x-rays, 2 views, frontal & lateral, etc.
24	8.6	1.386	0.0358	C	Interp bilat rib x-rays, incl posteroanterior chest, etc.
90	7.4	1.957	0.0312	D	Barium enema, double contrast, complete proc, occult GI, etc. (pa I
100	8.5	2.001	0.0355	E	Complete abd echography, B-scan, image doc, complete, etc.
107	9.2	2.028	0.0383	F	Interp computerized axial tomography, abd, etc., cancer
117	8.9	2.067	0.0370	G	Echography pregnant uterus, B-scan image doc, complete, etc.
208	9.0	2.318	0.0374	H	Computerized tomography guidance needle biopsy, etc.
14	9.1	1.157	0.0379	I	Interp rad exam ankle, complete, min 3 views, etc., fx
50	9.7	1.701	0.0404	J	Interp mammography, bilat, for 50yo pt w pain in breasts
159	10.3	2.201	0.0425	K	MRI spinal cord, incl spine, unexplained motor weakness, etc.
26	8.6	1.407	0.0357	L	Interp complete abd incl decubitus, etc., intest obstruction
68	8.1	1.835	0.0337	M	IV urography, pyelography incl kidneys, ureters, etc.
107	8.8	2.029	0.0368	N	Venography, unilat, complete proc, poss vein thrombosis, etc. (op Q
24	8.7	1.376	0.0361	O	Interp of complete skull series for headaches in an adlt
30	15.2	1.484	0.0616	P	Interp bone density study, dual photon absorbtiometry, etc. (rh L)
27	8.6	1.424	0.0357	Q	Interp lumbar spine x-rays, complete radiograph exam, etc.
91	9.2	1.957	0.0381	R	Hysterosalpingography, complete proc, 26yo F w infertility (op H)
178	8.7	2.251	0.0361	S	Perf & interp a lumbar myelogram, 68yo F (or S)
21	8.8	1.312	0.0367	T	Interp of hip x-rays, complete, for moderate/severe hip pain (rh Q)
	10.5		0.0432		

Table 50 continued

Positions on common scale of intra-service work: Rheumatology (rh)

Unlogged scale		Logged scale			
Location	Precision: location scale of work	Location	Precision: location scale of work	Service (in parentheses, services to which linked)	
47	...	1.672	...	*	Foll-up ov, etc., Stage II, Class II, rheumatoid arthritis (ai B)
263	7.1	2.420	0.0296	A	Init off eval SLE, fever, seizures and thrombocytopenia
21	8.4	1.317	0.0352	B	Interp x-rays, hands, bilateral, acute rheumatoid arthritis (or Q)
163	6.6	2.211	0.0279	C	Init off eval of 70yo F w polyarthralgia (py N)
211	6.7	2.324	0.0281	D	Consult hosp, 35yo F, fever, swelling joints, rash, etc. (py D)
47	8.1	1.674	0.0338	E	Aspiration of synovial fluid from knee (im C,or R)
42	8.5	1.622	0.0355	F	Perf & interp cell count, differential, etc., synovial fluid
39	8.9	1.595	0.0370	G	Inj corticosteroid prep into tendon sheath or trigger point
149	6.7	2.173	0.0281	H	Init off eval pt, negative lab and x-ray studies, fibrositis (py S)
72	6.5	1.855	0.0274	I	Foll-up visit 45yo, rheumatoid arthritis on gold, etc.
99	6.4	1.996	0.0271	J	Foll-up visit 40yo mother, Stage III, Class III, etc.
250	7.3	2.398	0.0305	K	Init off eval & mgmt pt, vasculitis and circulation
30	12.4	1.470	0.0509	L	Interp bone density study, dual photon absorptiometry, etc. (ra P)
76	6.5	1.880	0.0272	M	Foll up off consult, 45yo M ankylosing spondylitis, etc. (py O)
49	6.8	1.690	0.0285	N	Ltd ov, est pt known osteoarthritis and painful swollen knees (or K)
153	6.3	2.186	0.0267	O	Comp init eval 48yo M recurrent back pain radiating to leg (ai F)
12	9.3	1.062	0.0387	P	Interp of sed rate, (ESR) Westergren type
22	8.1	1.335	0.0338	Q	Interp of hip x-rays, complete, for moderate/severe hip pain (ra T)
10	9.5	0.990	0.0394	R	Interp of platelet count, Coulter counter

Table 50 continued

Positions on common scale of intra-service work: Thoracic/Cardiovascular Surgery (ts)

Unlogged scale		Logged scale		
Location	Precision: location scale of work	Location	Precision: location scale of work	Service (in parentheses, services to which linked)
284	...	2.453	...	* Permanent single chamber cardiac pacemaker implantation, etc.
2444	8.9	3.388	0.0371	A Redo CABGx3, 1st reop 68yo M, 3 yr post graft, etc.
116	8.8	2.066	0.0366	B Chest tube insertion for spontaneous pneumothorax, in 20yo (gs B)
36	13.4	1.551	0.0546	C Foll-up hosp visit, day 1 post-op chest tube insertion, etc.
1713	8.9	3.234	0.0370	D Primary CABGx3, 65yo M, etc., no complicating assoc disease
77	15.1	1.889	0.0610	E Hosp visit, day 2 post-op, CABGx3, 65yo M, no assoc disease
122	12.8	2.085	0.0522	F Init hosp eval pulm tumor 45yo smoker, prev in good health
198	10.4	2.297	0.0431	G Primary diag fiberoptic bronchoscopy, bronchopulm lesion (ot E)
1125	8.7	3.051	0.0361	H Left upper pulm lobectomy, for squamous bronchogenic ca (gs G)
1452	9.5	3.162	0.0394	I Prosth graft repl 10 cm abd infrarenal aortic aneurysm, etc.
344	9.5	2.536	0.0393	J Mediastinoscopy in pt w suspected paratracheal lymph nodes
131	12.8	2.119	0.0525	K Ext init off eval of 70yo F w increasing dysphagia
106	11.0	2.025	0.0452	L Thoracentesis, tot evac, effusion and suspected pulm tumor (ob S)
169	12.1	2.227	0.0496	M Init pericardiocentesis, 35yo M post chest trauma
113	13.4	2.054	0.0547	N Init off eval 50yo M w aortic aneurysm, to recommend surg (im K)
906	9.0	2.957	0.0375	O Carotid endarterectomy, unilat, 58yo F, hx ischemic attacks
1566	10.5	3.195	0.0434	P Rep ventricular septal defect in 5yo child
550	11.2	2.740	0.0461	Q Insertion, mgmt, & remov balloon pump, post CABG, etc.
331	10.1	2.519	0.0418	R Tracheostomy, emerg proc, transtracheal, in adlt, etc. (gs E)
1739	9.7	3.240	0.0404	S Tot esophagectomy w gastroesophageal anastomosis in chest (gs A)
1711	9.2	3.233	0.0384	T Primary aortic valve repl 50yo F, prosth valve, etc.
127	12.9	2.103	0.0527	U Eval 65yo M,chronic stable angina and coronary artery disease

Table 50 continued

Positions on common scale of intra-service work: Urology (ur)

Unlogged scale		Logged scale			
Location	Precision: location scale of work	Location	Precision: location scale of work	Service (in parentheses, services to which linked)	
92	...	1.966	...	*	Diag cystoscopy hosp, ambulatory surg, M w microhematuria
2426	9.6	3.385	0.0399	A	Tot cystectomy and ileal loop, urinary diversion, etc.
35	10.3	1.543	0.0426	B	Foll-up hosp visit 2 days post uncomplicated TURP in 70 yo M (gs U)
519	8.5	2.716	0.0353	C	Fulguration and resection medium bladder tumor, 2-5 cm 65yo M (opE)
80	9.4	1.902	0.0392	D	Off eval new onset right lower quad pain 32yo F, est pt
692	9.5	2.840	0.0394	E	Insertion non-inflatable, semi-rigid, penile prosth, 60 yo M
106	9.8	2.024	0.0407	F	Init consult for infertility in 35yo M
89	10.0	1.950	0.0413	G	Init off eval diagnosis & mgmt painless gross hematuria, etc.
919	8.5	2.963	0.0356	H	Transurethral resection of prostate, TURP, etc., BPH 70yo M
95	6.1	1.980	0.0257	I	Diag cystoscopy, off proc in M w microhematuria (dm M)
112	9.7	2.048	0.0403	J	Init eval and mgmt of recurrent renal calculi in 40yo M (fp P, gs S, im J, ob L)
435	11.0	2.639	0.0453	K	Cystoscopic laser ther superficial bladder tumor, in hosp
1167	9.8	3.067	0.0407	L	Percutaneous nephrostolithotomy, 1 stage, 2 cm stone or less (op A)
910	11.1	2.959	0.0458	M	Extracorporeal shock wave lithotripsy, etc., 2 cm renal stone
835	9.3	2.922	0.0388	N	Ureteroscopy w remov of calculus
92	9.4	1.966	0.0392	O	Init eval and mgmt of recurrent urinary tract inf in F (im S)
115	9.2	2.061	0.0382	P	Cystometrogram calibrated electronic equipment, etc.
226	7.1	2.353	0.0297	Q	Cystourethroscopy w insertion of indwelling ureteral stent (ob O)
44	12.6	1.640	0.0515	R	Semen analysis for infertility (op R)
141	9.8	2.150	0.0407	S	Init eval and mgmt of unexplained renal failure in a 40 yo F
470	9.9	2.672	0.0410	T	Uncomplicated indirect inguinal hernia repair, 45yo M
253	8.3	2.403	0.0348	U	Bilat vasectomy, incl post-op semen examinations

Table 51

Analysis of deviations from perfect alignment

	Root mean square of deviation[1]
If random errors in the _d_s were eliminated	0.025
If imperfections in links were eliminated	0.019
In the actual alignment	0.031

[1] The deviations are the 133 _e_s defined in Section 6.5.1.

Chapter 7

Pre- and Post-Service Time and Work

7.1 INTRODUCTION

The goal of the resource-based relative value scale (RBRVS) we are developing is to measure the resource costs of physicians' services. The central challenge posed by this goal is to establish a means to measure the relative total work involved in physicians' services. Total work encompasses (1) the physician's time before, during, and after the service itself (pre-, intra-, and post-service), and (2) the intensity with which that time is expended. A detailed discussion in Chapters 5 and 6 of the measurement of intra-service work has shown that it can be measured reliably and validly. This chapter will focus on pre- and post-service work.

The intra-service phase of physicians' work, such as seeing a patient in the office or the hospital, or performing surgery, is the most visible and the most closely identified with reimbursement. But patient encounters are often preceded by review of records, communication with other professionals or relatives, and preparation for procedures with staff. Afterward, the physician documents observations, diagnoses, and plans of treatment, and often communicates further with other professionals, the patient, and relatives. For surgeons, pre-operative and post-operative care can include admitting patients to the hospital and managing them in intensive-care units and conventional hospital facilities. The time spent on these tasks often exceeds the duration of the procedure itself.

For two reasons, we chose to estimate pre-, intra- and post-service work separately. First, the work involved in the three phases often differs markedly, making it difficult, if not impossible, for physicians to estimate directly the work of the composite service. To do so would entail an intricate cognitive process of estimating the time and intensity of each phase and then combining the estimates. Second, there is no uniform convention in billing for pre- and post-service work. Our method is designed to allow for flexibility in bundling the three parts of the service for payment purposes.

We obtained our estimates of intra-service work by surveying physicians directly, using the magnitude estimation method, as discussed in Chapter 3. Under this method a respondent is asked to rate the work of a service in relation to a reference service. We used a different reference service for each specialty. For methodological and practical reasons, we decided against this method for pre- and post-service work. First, the nature of pre- and post-service activities makes them difficult to measure by survey. Unlike the intra-service period, which is usually discrete, pre- and post-service work is often fragmented and intermingled with other activities. While reviewing one patient's chart, for example, a physician may telephone colleagues and discuss other patients as well. Also, in an effort to limit the time required to complete our telephone survey (to achieve optimal response rates and high quality feedback), we concentrated our survey efforts on the intra-service period, and obtained only a few direct estimates of pre- and post-service work.[1] For certain services, however, we did obtain direct estimates of pre- and post-service time.

This chapter describes a method for determining relative values for pre- and post-service work, using estimates of time and of rate of work per unit of time.

7.2 METHODS

Our methodology is twofold. To arrive at estimates of time spent, we began by surveying physicians for the pre- and post-service times of a subset of the 372 distinct services analyzed in depth in our national survey of physicians' work.[2] Regression analyses and other methods produced predictions of pre- and post-service times for services outside the subset. The regression analyses employed survey data on pre- and post-service times and on intra-service time and work.

We then used statistical methods and clinical guidance to predict estimates of the rate of work per unit of time (W/T) of pre- and post-services from intra-service data, since we had only a few direct estimates of pre- and post-service work. Finally, we systematically assigned W/T to pre- and post-service times of all our services.

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[1] We obtained direct work estimates for six services that were portions of pre- and post-services. We used these data in this paper to evaluate the results of our method (Table 74).

[2] The progression from 407 services we surveyed for intra-service work to 372 "distinct services" is due to the identification of "same services" in the cross-specialty process, as discussed in Chapter 6. The progression from 407 services to 372 services is described in detail in Table 77.

Pre- and post-service work are estimated by the following formula:

$$W_p = (T_p)\ (Wp/Tp)$$

where

W_p = pre- or post-service work

T_p = pre- or post-service time

and

W_p/T_p = W/T = rate of work per unit time for pre- and post-services, equal to work divided by time.

We describe our methods in detail below, following a discussion of a typology of pre- and post-service work.

7.2.1 A Typology of Pre- and Post-Service Work

To help estimate pre- and post-service time and W/T, we developed a typology of services. Pre- and post-service activities vary with the kind of service performed and the setting where they are rendered. Following a surgical procedure, for instance, a physician typically provides immediate post-operative care and makes hospital visits. Services following an office visit usually consist of recording diagnoses, reviewing laboratory results, and communicating with the patient and other professionals.

We identified six distinct categories of service -- evaluation and management, invasive, imaging, laboratory, pathology, and anesthesia -- and five service settings -- office, hospital, surgical center, emergency unit, and nursing home. We then combined these categories and settings to create 12 major classes of service, and assigned each of our services to one or another of the 12 classes. The purpose of this classification was to identify homogeneous groups of pre- and post-service activities so that the values derived from surveys could be applied to them with greater confidence.

Table 52 lists the ten service classes we have defined to have distinct pre-, intra-, and post-service work and their respective pre- and post-service activities. Pathology, laboratory, and selected imaging services were exceptions to this typology. We did not define separate pre- and post-service periods for pathology services. Through discussions with pathologists from our Technical Consulting Groups, we found an unclear distinction between the pre-, intra-, and post-portions of a pathology service. We estimated the relative total work of pathology services using total service time, as described below in section 7.2.4. In addition, the laboratory services and selected imaging services in our study, which were not performed by a pathologist or radiologist, respectively, were largely performed in the context of a patient visit. We assumed that any pre-and post-service work for these services was captured by the total work of the visit. Thus, we assigned no pre- and post-service time or work to the laboratory and imaging services of this type in our study.[3]

As shown in Table 52, we found the pre- and post-service activities associated with evaluation and management services in all settings, and for imaging services (performed by a radiologist), to be similar. For invasive services, however, we identified different pre- and post-services for procedures performed in an office, a surgical center, a hospital, or an emergency unit setting. The variations in severity and risk factors associated with invasive services performed in office and non-office settings, and the necessity of a hospital admission for the hospital invasive services, warranted classifying invasive services by setting.

We used one grouping of these service classes and their activities for the survey of physicians for pre- and post-service time. We, however, used a different grouping of the classes to predict unsurveyed pre- and post-service time and to estimate W/T, as described below.

7.2.2 The Estimation of Pre- and Post-Service Times

It would be ideal to obtain measures of pre- and post-service times from objective data, but an extensive search for sources such as physician logs was unproductive. Therefore, we decided to obtain data through two surveys of physicians for the pre- and post-service times for a subset of 153 of the 372 distinct services being analyzed, and to use the results to estimate times for the remainder. As discussed in section 7.3, the prediction of pre- and post-service times was necessary for services in eight service classes: evaluation and management services in an office, hospital, and emergency unit setting; imaging services; invasive services in an office, surgical center, and hospital setting; and anesthesia services. We predicted the times of these services using different methods.

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[3] This group of services includes a pathology service performed by a dermatologist (service S).

First, as described in Chapter 6, we included services in our study which were worded identically in the survey of physician work and included in the surveys of more than one specialty. If physicians from the Cross-Specialty Panels from the relevant specialties agreed that these services required the same amount of work and the same processes, we termed the services "same services". We set the pre- and post-service time of the non-surveyed "same services" to be equal to that of a corresponding surveyed "same service", if available. If the "same service" was surveyed for time in more than one specialty, a simple average of the mean responses was used. For example, we obtained ratings of intra-service work for a decompression of carpal tunnel from surveys of orthopedic surgeons and general surgeons. This service was termed a "same service" by physicans from both specialties. However, we only obtained estimates of pre- and post-service time from the survey of orthopedic surgeons. We set the pre- and post-service time for this service for general surgeons equal to that for orthopedic surgeons.[4]

To predict mean times for the remaining unsurveyed services, we used regression analyses. First, as discussed in Chapters 4 and 5, analysis of the survey responses for work and time showed that the data followed a logarithmic normal distribution. Thus we transformed the data into a logarithmic scale to simplify the regression and other statistical analyses and the estimation of the means and standard errors of the physician responses. The dependent variables of the regression model were the mean of the common logarithm of pre- and post-service times for the 153 services surveyed, and the independent variables were the means of the common logarithms of intra-service work and time for the same set of services from the national survey of physicians:[5]

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[4] There were two exceptions where we used this method to predict pre- and post-service times of a service where the services were not the "same services." These two services were the tracheostomy for otolaryngologists (service M) and an unscheduled nursing home visit for family practitioners (service S). We set the pre- and post-service time for these services equal to that of services which were worded identically, but not defined as "same services" during the cross-specialty process. These services were a tracheostomy performed by general surgeons and thoracic surgeons (services E and R, respectively) and an unscheduled nursing home visit by an internist for the otolaryngology and family practice services, respectively. We made these exceptions based on the lack of sufficient data within the emergency unit invasive and nursing home evaluation and management service classes for prediction and the identical wording of the services used to predict the times.

$$T_p = a + b*Wi + c*T_i$$

where

T_p = mean of the common logarithm of pre- or post-service time;

W_i = mean of the common logarithm of intra-service work; and

T_i = mean of the common logarithm of intra-service time.

Each observation in the regression represented a service.

In performing these regressions for invasive services in surgical center or hospital settings, we first removed the scrubbing and waiting time from the pre-service time before performing the analysis. We found surveyed estimates of this portion of pre-service time to be relatively constant across services and not dependent on the intra-service time or work of the invasive procedure involved. We computed the mean of the surveyed estimates of scrubbing and waiting time for surgical center and hospital invasive services separately. Following prediction of pre- and post-service time, we added these amounts to the respective estimates of non-scrubbing and waiting pre-service time to compute total pre-service time for all services in these service classes.

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[5] Since different specialties rates the intra-work of a service using different reference services, we aligned the intra-service work values of all specialties onto a common scale, as described in Chapter 6.

We used a statistical test of the equality of the coefficients of different regression models to determine whether data from different service classes could be combined for prediction (Chow, GC, 1960). We then estimated the parameters (a, b, and c in the above equation) for each of the resulting models and used intra-service work and time data to predict pre- and post-service time for the unsurveyed services.

We used the same regression approach described above to predict mean pre- and post-service times for anesthesia services. However, we surveyed pre- and post-service time for a total of five anesthesia services. In addition, only three of these anesthesia services were surveyed by anesthesiologists, an insufficient sample size for regression using service level data. The different nature of anesthesia services, analysis of the regression residuals from the predictive models described above, and the analysis and results of predictions combining anesthesia with the above models, including suggested data from other service classes could not be combined with the three observations for anesthesiologists to predict anesthesia pre- and post-service time. Therefore, we performed within-specialty regressions for the anesthesia services using individual, rather than mean, physician responses for work and time for the three services; that is, each observation in these regressions represented an individual physician's response.

Finally, there were 18 selected services which we assumed did not fit the methods for predicting pre- and post-service time described above. For these services we used the clinical judgement of physician investigators (practicing physicians on our study team) and available data on similiar services to assign pre- and post-service times. One example of these services are selected services involving child birth in our survey. A second example of these services are the eleven selected psychiatric services involving regularly scheduled or repeat office visits, such as a follow-up psychotherapy office visit with a 48 year old housewife for treatment of agrophobia. These psychiatric services are commonly scheduled within a set time period (for example in one hour intervals) and involve similiar amounts of pre- and post-service time. We set the pre- and post-service times of each of these visits equal to the pre- and post-service time of an office visit for termination of a 66 year-old business executive from twice weekly in-office psychotherapy sessions after three years of psychotherapy which we had surveyed directly for pre- and post-service time. A list of all the services we selected for this method of estimating time is included in Table 53. All of these estimates of pre- and post-service time were reviewed by physicians from the respective specialties, as discussed in section 7.4.1.4.

7.2.3 The Work Per Unit Time for Pre- and Post-Services

The work of pre- and post-services is a function of the time spent performing them and the rate of work during that time. We estimated the W/T of pre- and post-services by inferring from intra-service data. The major questions that this task posed were:

1) What types of intra-services have W/T values typical of the W/T values of pre- and post-services?
2) What W/T value is appropriate for each pre- and post-service?

To answer these questions we made two key assumptions:

1) Pre- and post-services consist essentially of evaluation and management. The W/T values of the evaluation and management intra-services analyzed in our survey are typical of the pre- and post-service W/T values; and
2) The W/T for pre- and post-services is positively correlated with the corresponding intra-service work.

The first assumption postulates that pre- and post-services, like evaluation and management services are non-procedural and generally involve making diagnoses and designing strategies of management.

The second assumption postulates that patient conditions and risk factors associated with higher ratings of intra-service work also require higher levels of pre- and post-service W/T. Physician investigators, asked to list criteria for identifying services with higher levels of pre- and post-service W/T, included the patient's diagnosis and risk factors and the complexity of the treatment regimens prescribed. In our investigation of intra-service work, we found that services with higher work ratings were also associated with these criteria.

For each of the 144 distinct evaluation and management services analyzed in the national survey, we computed the W/T using the the mean rating of intra-service work for the service in relative work units and the corresponding mean rating of intra-service time in minutes. To simplify the assignment of the resulting W/T values to the pre- and post-services, we aggregated the 144 W/T values into four groups using statistical cluster analysis (Anderberg, MR, 1973). As discussed above, we transformed the W/T values using common logarithms for the analysis. More specifically, we subtracted the mean logarithm time from mean logarithm work for each service to calculate logarithm W/T. We then assumed that the antilogarithm of the mean logarithm W/T value for each of the four groups produced by the cluster analysis is the typical W/T value for each of four levels of pre- and post-service W/T.

We chose four levels of W/T for pre- and post-services based on the range of intra-service W/T values for evaluation and management services in our study and the distribution of these values within that range. First, most of the values for W/T for these services fell within a two-fold range (on the untransformed scale). This range can be compared to the greater than ten-fold range in W/T values for all the services in our study. Second, we examined the homogeneity of the logarithm W/T values within the four groups produced by the cluster analysis and the heterogeneity of the values across these groups and found four levels to be sufficient. We chose not to refine the measurement of W/T by defining more than four levels.

We next assigned these four levels of W/T to the pre- and post-services of the 372 services in our study. To facilitate this assignment, we again used statistical cluster analysis and classified all 372 distinct services under study into homogeneous groups based on the mean ratings of intra-service work for each service. Common logarithms of intra-service work were inputs to the cluster analysis. For three broad classes of services -- non-invasive services; office, surgical center invasive services, and anesthesia services; and hospital invasive services -- we performed separate cluster analyses. We assumed that the varying nature of the work in these broadly defined service classes required a separate clustering of intra-service work within each class. Our physician investigators found the assignments using this method to be more reasonable than those obtained by clustering once across all service classes.

In each of these three broad classes we clustered services into low, medium, and high intra-service work groups, for a total of nine groups of services. (The ratings _low_, _medium_, and _high_ have no absolute values across broad service classes; they are relative terms, meaningful only within a given class.) We then assigned one of the four levels of W/T to the pre- and post-periods of the services in these nine groups, based on whether the group represented a low, medium, or high value of intra-service work.

Figure 5 summarizes our method of assigning W/T. We postulated that the pre- and post-service W/T of the three-service levels (low, medium, and high) for each broad service class would be consistent with the first, second, and third levels of W/T, with the exception of post-service _hospital invasive services_ to which we assigned the W/T of the second, third, and fourth levels. Our assumption of higher levels of post-service W/T for hospital invasive services was based on the perceived relative patient severity associated with invasive services requiring a hospital admission.

Finally, in calculating the pre-service work for surgical center and hospital invasive services, we treated separately the time a physician spends scrubbing and waiting before a surgery. Assuming the W/T for scrubbing and waiting to be constant across these invasive services and to be lower in value than the W/T of all the remaining pre- and post-service activities, we arbitrarily assigned to scrubbing and waiting a W/T equal to one-half of the first, or lowest, level of W/T.

7.2.4 The Pre- and Post-Service Work of Pathology Services

As discussed above, we did not obtain separate estimates of pre- and post-service time for pathology services. We first surveyed pathologists for the intra-service service work and time of pathology services. We then refined our method and obtained estimates of total service time, as discussed in section 7.3. However, we did not obtain direct estimates of total service work. We computed the total service work for pathology services by multiplying the W/T of the intra-service by the corresponding total service time.

7.3 DATA

In Chapter 5 we have described in detail the questionnaire, sample, and response rates for the national survey of physicians for intra-service work and time. Data from this survey were used to compute work per minute using the method described above. We focus in this section on the data for pre- and post-service time.

7.3.1 The Survey of Pre- and Post-Service Time

We obtained pre- and post-service time from two telephone surveys of 18 and 7 specialties, respectively. The two surveys differed in the number of services covered, the sequence of questions and, for some services, in their wording.

We obtained estimates of pre- and post-service time from the two surveys using the activities described in Table 52. We asked physicians to estimate the total pre- and total post-service time for a service, except for pathology, hospital and surgical center invasive and anesthesia services. For pathology services we surveyed total service time. For invasive procedures and anesthesia, we divided the pre-service period into: 1) pre-procedural work-up and hospital patient visits; and 2) scrubbing and waiting and setting up, if necessary. We also segmented the post-service period of these services into: 1) immediate post-procedural care; 2) additional follow-up on the day of the procedure; 3) the number of times the physician sees the patient in the hospital following the procedure, if applicable; and 4) the duration of those visits. The survey instruments for the first and second surveys of pre- and post-service time are included in Appendices I and N, respectively.

In our first national survey for intra-service work and time, we asked physicians in each of 18 specialties for the intra-service time of approximately 23 services and then obtained estimates of pre- and post-service times for three of those services (four for obstetrics and gynecology). The 55 services were selected by physician investigators to represent the full spectrum of service work and activities within each specialty.

Upon review, however, we concluded that the data for the 55 services surveyed were insufficient to make reasonable predictions of pre- and post-service time for all major classes of service. In particular, we had obtained few surveyed estimates of pre- and post-service time for the office and surgical center classes of service. We thus conducted a second national survey of physicians' time.

The second survey asked physicians for estimates of pre-, intra-, and post-service time, in that order. We also refined the format of the questions in the second survey for office invasive, surgical center invasive, and pathology services in response to medical experts' criticism of the wording and scope of the questions for some services. The re-survey of pathology services for total service time is an example of this modification. The surveyed physicians, all respondents to the initial survey, were specialists in allergy and immunology, general surgery, internal medicine, oral and maxillofacial surgery, orthopedic surgery, pathology, and thoracic surgery. The response rates for the second survey, are shown in Table 54. For the second survey we surveyed 560 physicians, and completed 367 interviews for an overall response rate of 66 percent. The response rates ranged from a high of 91 percent in pathology to a low of 44 percent in thoracic surgery.

To gather data on enough services in each class to permit predictions of pre- and post-service times, we selected 121 distinct services from the seven specialties for the second survey.[6] We chose the seven specialties and 121 services based on two criteria: 1) to cover each of the major categories of service to permit prediction of pre- and post-service time; and 2) to cover specialties whose pre- and post-services may be unique. Specifically, we included the specialties: internal medicine, general surgery, allergy and immunology and orthopedic surgery to increase the number of services in the major service classes. We included the specialties: pathology, oral-maxillofacial surgery, and thoracic surgery due to the different nature of some of their pre- and post-services. For example, we included selected surgical hospital invasive procedures performed by thoracic and cardiovascular surgeons which commonly involve more severely ill patients than other surgical services and require longer postoperative hospital stays and additional visits by the physician to the patient in the hospital. We included most services from these seven specialties in the second survey. The survey coverage of services by specialty ranged from 16 of 25 internal medicine services to all of the pathology services.

As Table 55 shows, the two surveys generated pre- and post-service time data for a total of 154 different services. We obtained estimates for a high percentage of the services in our study in most of the major classes of service category and setting. These data allowed us to predict pre- and post-service times to all services in our study.

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[6] We included 128 separate survey questions in the second survey. However, some of the "same services" were surveyed in more than one specialty, resulting in 121 distinct services.

Finally, before performing statistical analysis of the survey information, we transformed and edited the data. As mentioned above and discussed in detail in Chapters 4 and 5, analysis of the survey responses for work and time showed that the data followed a logarithmic normal distribution. Thus we transformed the data into a logarithmic scale to simplify the regression and statistical cluster analyses and the estimation of the means and standard errors of the physician responses. All results are reported, however, on the untransformed scale. We edited the data to remove extreme high and low outliers (those that differed by more than three standard deviations from the mean of those remaining). The editing process used the mean and standard deviation of the logarithm of the surveyed responses for time and involved an iterative proccess. First, we calculated the mean and standard deviation of total pre- (excluding scrub and wait time) and total post-service time. We then set to missing values all pre- or post-service time responses that differed from the respective mean response by more than three standard deviations. We performed this process three times. Fewer than one percent of the ratings were eliminated for this reason. After editing the data, we calculated the means and standard deviations of pre- and post-service time.

7.4 RESULTS

7.4.1 Pre- and Post-Service Time

7.4.1.1 Survey Estimates of Pre- and Post-Service Time

We present a summary of the estimates of pre-, intra-, and post-service time from the first survey of time in Table 56. We include in this table the number of non-missing responses in the sample, the antilogarithm of the mean of the logarithm of responses and the approximate standard error as a percentage of the mean on the untransformed scale. The results for the second survey, with the exception of pathology, are reported in Table 57. The estimates for pathology services are shown in Table 58.

The pre-service time estimates from the two surveys in Tables 56 and 57 range from 1.2 minutes to 134.4 minutes for an office evaluation for possible conjunctivitis by an internist to a Lefort 1 maxillofacial and sagital split, etc. by an oral maxillofacial surgeon, respectively, while the post-service times range from 3.7 to 253.0 for an interpretation of lumbar spine x-rays by a radiologist and a total esophagectomy by a thoracic surgeon, respectively. As shown in the tables, the highest typical pre- and post-service times, obtained from surveys, were for surgical center invasive and hospital invasive services. The standard errors of pre- and of post-service time are similiar in magnitude. Although comparable, the standard errors of pre- and post-service time are larger than those for intra-service time.

Finally, we discuss non-responder bias. We discussed non-responder bias in the first survey for intra-service work and time in Chapter 5. For the second survey of time, we used a statistical test of the difference between two means to investigate non-responder bias. We compared the estimates of pre- and post-service time of the responders to the first survey who failed to respond to the second survey with those of physicians who responded to both surveys for time. Our null hypothesis was that there is no difference between the mean responses for pre- and post-service time for the two groups. A test for the difference between the mean of the common logarithm of the responses for pre- and post-service time for the two groups showed that in only one of 42 cases (three cases each for pre- and for post-service time for seven specialties) was the null hypothesis rejected at the 5 percent level. The results of this analysis are shown in Table 59.

Finally, based on analysis of secondary data on time such as the Mendenhall study and the analysis of data from the two surveys of time, we adjusted downward the surveyed pre- and post-service times of the 17 evaluation and management services which were surveyed in the first, but not the second, survey. This adjustment factor was 30 percent. Table 60 shows these 17 services, the surveyed time estimates and adjusted times.

7.4.1.2 Prediction of Pre- and Post-Service Time

As described in the discussion of methods, we used regression analyses to obtain estimates of pre- and post-service time for unsurveyed services. We first used a statistical test of the equality of the coefficients of different regression models to determine whether data from different service classes could be combined for prediction. The results of this analysis are shown in Table 61. The results showed that we should use eight separate regression models for predicting pre- and post-service times:

Pre-Service Time

1) office evaluation and management and imaging services;
2) hospital and emergency room evaluation and management services;
3) office invasive services;
4) surgical center and hospital invasive services.

Post-Service Time

5) office, hospital and emergency room evaluation and management services and imaging services;
6) office invasive services;
7) surgical center invasive services;
8) hospital invasive services.

The results for these prediction models are shown in Table 62. A measure of the within-sample predictive power of these regression models is the square of the multiple correlation coefficient (r-square). The r-square for the prediction models range from 0.57 to 0.74 for pre-service time and 0.44 to 0.85 for post-service time. The model F-statistic in the rightmost column shows each of the models are statistically significant predictors of pre- and post-service time at the 5 percent level, with the exception of the surgical center invasive model for post-service time. The r-squares of the models for pre-service time were highest for invasive services, and those of post-service time were highest for the noninvasive services. In general, across service classes, the r-square values were similiar for pre-service time and post-service time. The majority of the estimated parameters for intra-service work are significant, while two of the eight parameters for intra-service time are significant at the 5 percent level. These estimated parameters were used to compute the pre- and post-service times of services in the respective service classes. Since the data were analyzed using common logarithms, the results were retransformed using antilogarithms to produce pre- and post-service time in minutes. As a result, the "smearing estimate" was used to adjust predictions of pre- and post-service time for retransformation bias (Duan, 1983).

Finally, Table 63 shows the results for the predictive model for anesthesia. The r-squares for the predictive models using individual data are lower than those reported for the models using mean estimates in Table 62.

Table 64 shows estimates of pre- and post-service times from both survey and prediction. The results are grouped by service category and sorted by the percentage pre- and post- of total time. The pre- and post-service times for "same services" represent a simple or weighted average of the surveyed or predicted times for the services involved. The combination of service work and time for these services is discussed in Appendix O, Table O.3. The "same services" are identified by identical vignettes and equal pre-, intra- and post-service time. As shown in Table 64, the higher pre-and post-service times were for surgical center invasive and hospital invasive services. Clearly, pre- and post-service time accounts for a significant portion of total time, particularly for invasive services.

7.4.1.3 Reproducibility of Pre- and Post-Service Time

One predictor of the reproducibility of the time estimates is the standard errors of the surveyed data. The standard errors of the mean estimates for individual services for the surveyed responses were presented in Tables 56 and 57. Table 65 presents the mean standard errors of pre-, intra- and post-service times by class of service, reported as a percentage of the mean.[7] The table indicates that the typical standard errors for pre- and post-service time are larger, as a percentage of mean time, for evaluation and management and office invasive services. The standard errors are larger, but comparable, to those for physicians' ratings of intra-service time, as indicated in Tables 56 and 57, and are also larger, than those we found for intra-service work, as shown in Chapter 5.

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[7] Since the standard errors of intra-service time are from responses to the first survey and thus based on a different size sample of physicians than those pre- and post-service time estimates from the second survey (there were more physicians in the first survey than in the second) we adjusted the sample sizes of the second survey to reflect those from the first survey before calculating these mean standard errors. This

7.4.1.4 Reasonableness of Pre- and Post-Service Time

To assess the reasonableness of our findings about time -- that is, to ask: are these results reflective of the time physicians actually spend in pre- and post-service work? -- we used two approaches. First, we subjected the time estimates to extensive review by physician consultants from Technical Consulting Groups (TCGs) covering the 18 specialties in our study. The time estimates were first reviewed for reasonableness by each specialty at the TCG meetings during the summer of 1987. We subsequently mailed the time estimates to additional physicians from the TCGS for further review. In all cases, we only asked physicians to review the pre- and post-service times of services in their own specialties. The TCG panelists concluded that our estimates of pre- and post-service time generally reflect their clinical experience. In 3 percent of all

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adjustment was only made to permit the comparison shown in Table 65.

services, they identified systematic errors in our survey or prediction methodology; these estimates were modified accordingly. For instance, such a modification was made for an unanticipated phone call to a physician, which involves no pre-service time. We have included a list of those services where time estimates were modified in Table 66.

We also assessed reasonableness by comparing our results with data from other sources, although the information was limited. We compared our total office-visit times, including pre- and post-service time, with data from two studies of physicians' practice: the AMA Socioeconomic Survey of Physicians, and the Mendenhall study (American Medical Association, 1988 and Mendenhall R, 1981).[8] We compared these two sources' aggregate patient-care times and visit frequencies with our mean total service times for limited and intermediate office visits, as coded by the CPT-4 coding system (Fanta CM, Finkel AJ, Kirshner CG, 1986). The AMA and Mendenhall results are not reported by type of visit; we assumed the average office visit in the AMA and Mendenhall data to be either a limited or intermediate visit.

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[8] The AMA Socioeconomic Survey was conducted annually using a random sample of physicians in the United States and collects information on physician hours spent on patient care, and the frequency of performance of services in selected classes. The Mendenhall study was conducted in the late 1970s to create a comprehensive data base of the activities of physicians and used detailed time logs to assess physicians' daily activities.

This assumption was made based on an examination of the frequency of office visit codes in the 1986 BMAD file of Medicare claims. The majority of all Medicare office visit claims were coded as either limited or intermediate office visits, with no other office visit code having a substantial percentage of the claims. Given this assumption, and the aggregate nature of the AMA and Mendenhall data, we consider this comparison an approximate test of the reasonableness of our results. The results for four specialties are presented in Table 67. As the table shows, the AMA and Mendenhall time estimates are similar, except for general surgery. Our estimates of total time were generally within 20 percent of the AMA and Mendenhall estimates.

7.4.2 Pre- and Post-Service Work Per Unit Time

We found the work-per-minute values for evaluation and management services to range from 1.6 for an office visit advising the removal of wisdom teeth to 6.1 for a hospital visit on the second day after a three-vessel coronary-artery bypass graft. A summary of the work-per-minute values for the evaluation and management services used to estimate the four levels of pre- and post service W/T is shown in Table 68. As indicated in Table 68, the antilogarithms of the mean of the logarithm work-per-minute values for the services in each of the four levels of W/T defined by cluster analysis were 2.16, 2.80, 3.44, and 4.85, respectively. (For purposes of comparison, the intra-service work-per-minute values for invasive services in our study ranged from 2.4 for a single injection for immunotherapy to 19.4 for an intubation of a newborn.) Our physician investigators considered the two-fold difference in work-per-minute between the first and fourth levels to reflect their clinical experience accurately.

These mean work-per-minute values for the four levels were assigned to the services in the nine intra-service work groups and used in the calculation of pre- and post-service work as presented in Figure 5. The results of the clustering of the intra-service work values of services in the three broad service classes, including the assigned pre- and post-service W/T for each service, are shown in Tables 69 and 70. To assess the reasonableness of these assignments of W/T, we asked a surgeon and an internist from our group of physician investigators to classify all the services of which they had sufficient knowledge into four levels of pre- and post-service W/T. For a small number of all services did the clinicians' assignments diverge by more than one level from those based on the statistical analysis shown in Table 69. In those cases, we adjusted the statistical assignments to reflect the average of the statistical and clinical assignments. For instance, such an adjustment was made for a chest tube insertion for spontaneous pneumothorax. This procedure does not involve a large amount of intra-service work or time but requires extensive post-service follow-up. Table 71 lists each case where the statistical clustering method differed from the clinical clustering method by more than two levels.

We also assessed the reasonableness by comparing our assigned work-per-minute values with surveyed measures of pre- and post-service work-per-minute. In our national survey, we had asked about work for a few services that were portions of pre- and post-services, where we had also surveyed the work of the intra-service. These services included a hospital admission and post-operative visits for six hospital invasive procedures. As Table 72 shows, the surveyed and assigned results are similar. For example, we surveyed the intra-service work of a transurethral resection of the prostate (TURP) and the intra-service work of a follow-up hospital visit 2 days post TURP. The hospital visit is a portion of the total post-service for a TURP. As shown in Table 72, the surveyed work per minute of the hospital visit was 3.61, while the assigned work per minute from our clustering methodology was 3.44.

7.4.3 Pre- and Post- Service Work

Table 73 presents work estimates for all of our services under study, including pre- and post-service work estimates and pre- and post-service work as a percentage of total work. The results are grouped by service category and sorted by the percentage of pre- and post-service work of total work. These work estimates are the product of the pre- and post-service time estimates (total service time for pathology) and the assigned W/T values. Table 74 presents mean work estimates for each of the service classes (not including those services not defined to have pre- and post-service time). These tables show the typical pre- and post-service work values are highest for surgical center invasive and hospital invasive services. As a percentage of total work, typical pre- and post-service work values range from 29 percent for imaging to 46 and 47 percent for hospital invasive and anesthesia services, respectively .

Finally, Table 75 shows the frequency of the percentage of pre- and post-service work of total service work, by service class, by 10 percent increments. As shown in the table, for the majority of the services in our study the percentage of pre- and post-service work to total service work is between 30 and 50 percent.

7.5 COMMENT

The results of this chapter indicate that pre- and post-service work and time account for a substantial portion of physicians' total work and time in performing a service, particularly for anesthesia and for surgical center and hospital invasive services. We found that the percentages of total work accounted for by pre- and post-service work can range widely between services, from seven to 70 percent. However, these percentages fall within a narrow range, from 25 to 50 percent, for three-fourths of our services. Therefore, with some exceptions, the relative work relationships among services are not greatly changed by incorporating pre- and post-service work into computations of total work.

There is no objective standard with which we can compare our results to ascertain how well they represent reality. The estimates of pre- and post-service times that we elicited from surveys of physicians exhibit a precision comparable to the survey estimates of intra-service time and work, which we earlier found to be measured reliably. Our Technical Consulting Group panelists and physician investigators reviewed and found that our estimates of pre- and post-service time reasonably reflected their practice of medicine.

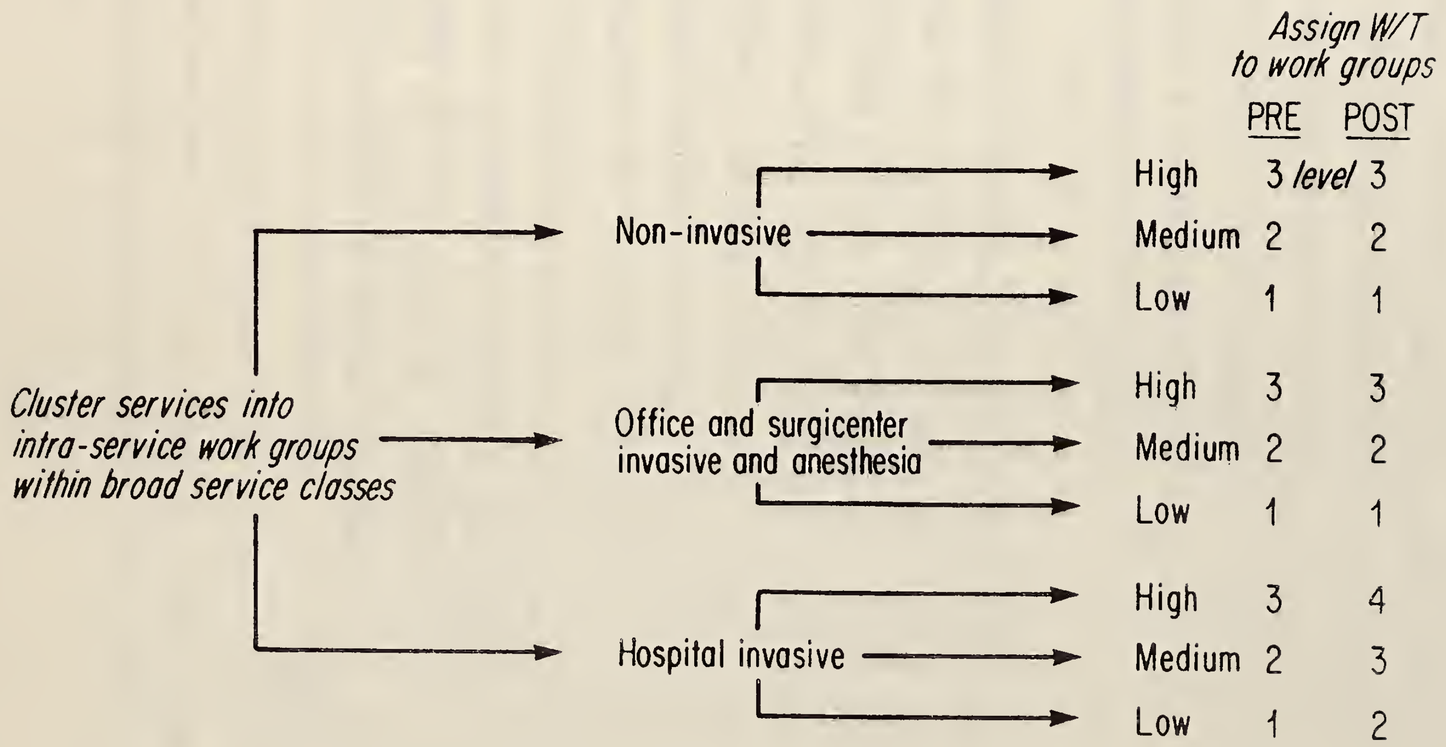
Despite the reproducibility and general reasonableness of these results for time, our use of survey information, our prediction of time for selected services, and a number of assumptions raise the question of an imprecision or bias in our results. The subjective estimates of time by physicians are one potential source of bias. First, unlike intra-service work, pre- and post-service work is often fragmented and intermingled with other activities. When these time data are obtained by survey methods relying on recall, double-counting of time may occur. Second, surveyed physicians showed a preference for round numbers in their judgments of pre- and post-service time and often provided responses such as 5, 10, 15, or 30 minutes, rather than providing more exact estimates. For example, for brief tasks requiring a few minutes, there might be a tendency to give a larger estimate of time, such as five minutes. If physicians rounded their responses upward, increased time estimates would result.

We have not found a way to detect biases produced by our method using current data. However, unless a bias is unsystematic across services or classes of service, the relative nature of an RBRVS will minimize their effect on total work. We can calculate the effect on relative total work of an imprecision due to inaccurate estimates of pre- and post-service work. This is done by using the percentages of total work accounted for by pre- and post-service work. For example, a 20 percent error in the estimation of pre- and post-service work would translate into a five to ten percent error in total work for the majority of our services.

Further research studies should be conducted to obtain more exact measurements of pre- and post-service work. It would be extraordinarily difficult to measure the pre- and post-service work of physicians directly for each service, particularly for noninvasive services. To do so may require time-and-motion studies, involving a vast budget, extensive research time, and the full cooperation of clinicians. However, it may be possible to use a structured group process involving physicians, or time studies conducted in organized settings to measure work, time and W/T more exactly. For this study, we developed and pursued a systematic process, and generated reasonable estimates of pre- and post-service work.

Figure 5

Assignment of pre- and post-service work per unit time (W/T) to services


Cluster services into intra-service work groups within broad service classes
Non-invasive
Office and surgicenter invasive and anesthesia
Hospital invasive
Assign W/T to work groups
PRE
POST
High 3 level 3
Medium 2 2
Low 1 1
High 3 3
Medium 2 2
Low 1 1
High 3 4
Medium 2 3
Low 1 2

Legend for Figure 5

Figure 5

Assignment of pre- and post-service work per unit time (W/T) to services

Footnotes:

[1] We used three cluster analyses to divide services into low, medium and high intra-service work groups within each of three broadly defined service classes: non-invasive; office and surgical center invasive and anesthesia; and hospital invasive services.

[2] We assigned the first, second and third levels of pre- and post-service W/T to services in the low, medium and high groups o each broad service class, respectively, except for the post-services of hospital invasive services which received the second, third and fourth levels of W/T. Note that within service classes, higher intra-service work groups were assigned a higher W/T level. We calculated pre- and post-service work by multiplying the pre- or post-service time of a service by the W/T value of W/T level assigned to the service.

Table 52

Pre- and post-service activities for major classes of service

Service class[1]	Pre-service activities	Post-service activities
Evaluation and management services		
Office setting	Review of records, communication with other professionals.	Arranging for and reviewing further services, communication with patient and other professionals, review of literature, writing orders.
Hospital inpatient setting		
Nursing home setting		
Emergency unit setting		
Imaging services	Same as evaluation and management.	Same as evaluation and management.
Anesthesia services	Patient visits, record review, history and physical, informed consent, writing orders, communication with other professionals and the family.	Immediate post-operative care, communication with other professionals, writing orders, all other follow-up before discharge.

Table 52 continued

Pre- and post-service activities for major classes of service

Service class[1]	Pre-service activities	Post-service activities
Invasive services		
Office setting	Review of records, communication with other professionals, procedural set-up, positioning the patient, checking equipment.	Arranging for and reviewing further services, communication with patient and other professionals, writing orders.
Surgical center setting	Pre-procedure work-up, time with the patient, scrubbing and waiting.	Immediate post-operative care, dictating notes and writing orders, communication with family and other professionals, follow-up the day of the service.
Hospital inpatient setting	Hospital admission work-up, patient visits, scrubbing and waiting.	Immediate post-operative care, dictating notes and writing orders, communication with family and other professionals, all other follow-up before discharge.
Emergency unit setting	Review of records, communication with other professionals.	Arranging for and reviewing further studies, communication with patient and other professionals, writing orders, arranging for transfer to another service and admission to hospital.

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[1] We did not define pre- and post-service activities for laboratory services performed in the context of an office visit and did not separate the total service into pre-, intra-, and post-service periods for pathology services.

Table 53

Services for which pre- and/or post-service time were assigned based on clinical judgment

Specialty[1]	Service description	
fp	H	Uncomplicated spontaneous vaginal delivery
ob	E	Normal uncomplicated labor, multipara, no risk, 1x w pt
ob	F	Labor, moderate hypertension, etc., 1x spent w pt
ob	H	Protracted labor req pitocin, etc., 1x spent w pt
ob	M	Uncomplicated spontaneous vaginal delivery
pe	A	Attendance in delivery room w resus of 2000 gram infant
pe	K	Intubation of newborn
py	*	2nd ov after referral from internist, 25yo M panic attacks
py	B	Phone conv, retarded mother of 18yo schizophrenic M, etc.
py	C	Foll-up psychother ov, 48yo housewife for tx of agoraphobia
py	H	Weekly med psychother and pharmacother ov, 36yo F, etc.
py	I	Family psychother, husband of 28yo F, bipolar illness, etc.
py	K	Group med psychother in-off, 6 pts seen weekly, etc.
py	O	Ov chemother for mgmt of 44yo M w bipolar depression
py	P	Electroconvulsive ther, 1x seizure, 82yo widowed M hosp, etc.
py	R	1x supervisory conf, team RNs, SWs, andn MHWs, psych unit
py	S	Ov diag reeval 68yo F, chronic depression, unresponsive tx
py	U	Ov individ psychoanalysis 42yo, passive-aggressive, etc.

[1] Specialty abbreviations: ai allergy and immunology, an anesthesiology, dm dermatology, fp family practice, gs general surgery, im internal medicine, mx oral and maxillofacial surgery, ob obstetrics and gynecology, op ophthalmology, or orthopedic surgery, ot otolaryngology, pa pathology, pe pediatrics, py psychology, ra radiology, rh rheumatology, ts thoracic surgery, ur urology.

Table 54

Sample size and response rates for the second survey of pre- and post-service time

Specialty	Number of responses	Percent response rate[1]
Allergy and immunology	54	68
General surgery	38	48
Internal medicine	54	68
Oral and maxillofacial surgery	66	83
Orthopedics	47	59
Pathology	73	91
Thoracic and cardiovascular surgery	35	44
All specialties	367	66

[1] Eighty physicians were surveyed in each specialty.

Table 55

Distribution of surveyed pre- and post-service time data by class of service

Service class	Study services[1]	Services surveyed for pre- and post-service time	Percentage of study services surveyed for pre- and post-service time
Evaluation and management services			
Office setting	105	41	39
Hospital inpatient setting	30	17	57
Nursing home setting	3	2	67
Emergency unit setting	7	4	57
Imaging services	21	3	14
Anesthesia services	25	5	20
Invasive services			
Office setting	38	14	37
Surgical center setting	21	12	57
Hospital inpatient setting	75	38	51
Emergency unit setting	2	1	50
Pathology services[2]	16	16	100
Total	343	153	45

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[1] The number of study services signifies the number of distinct services surveye for intra-service work that we defined to entail pre- and post-service work.

[2] Pathology services were surveyed for total service time.

Table 56

Survey estimates of pre-, intra-, and post-service time: Mean and standard error as a percent of the mean

First national survey of physicians

Specialty/Service description		Mean of survey estimates of service time[1]			Standard error as a percent of the mean[2]		
		Pre-	Intra-	Post-	Pre-	Intra-	Post-
ai *	Foll-up ov for pharmacological mgmt of 30yo F w hay fever	6.3	14.8	11.2	8.9	3.6	7.9
ai B	OV, est pt, 6yo child w sore throat and headache	4.1	15.5	9.4	9.7	3.9	8.6
ai O	OV 45yo M, est pt, chronic asthma, on chronic steroid, etc	7.5	24.7	13.9	8.0	3.5	5.9
an *	Anesth for inguinal hernia rep	37.3	64.7	26.4	3.9	2.5	6.0
an C	Anesth for colectomy	55.0	145.5	43.7	3.8	3.1	4.9
an K	Anesth for rep of AAA	82.6	242.7	93.9	3.4	2.7	5.6
dm G	Off revisit for eval of 28yo M w onychomycosis	2.5	8.7	4.3	10.0	5.2	9.2
dm J	Init ov, 16yo M w severe cystic acne, new pt	2.9	19.1	7.3	11.8	4.2	9.5
dm T	Init comp eval 30yo F w symptoms of SCLE	5.9	26.0	11.8	12.0	4.2	9.0
fp L	Ov, est pt, 6yo child w sore throat and headache	2.8	11.7	5.4	9.4	3.6	9.2
fp M	Off eval, poss purulent conjunctivitis 16yo F, est pt	2.1	11.2	4.1	8.4	3.8	8.5
fp P	Off eval new onset right lower quad pain in 32yo F, est pt	4.3	24.3	13.5	8.2	3.4	6.4
gs *	Uncomplicated indir inguinal hernia rep, 45yo M	66.7	41.5	48.7	4.4	3.3	5.9
gs G	Low anterior resection for rectal CA	104.6	152.8	172.8	4.6	2.5	4.5
gs K	Cholecystectomy for cholelithiasis	82.7	64.8	105.3	4.6	3.4	4.7
im *	Foll-up visit 55yo M, mgmt hypertension, beta/thiazide	4.3	15.6	7.5	9.0	2.7	8.3
im B	Ov, sore throat, fever, fatigue 19yo college student, est pt	2.9	13.8	8.0	10.1	4.1	8.5
im L	Off eval 28yo pt regional enteritis, diarrhea, est pt	6.2	26.2	12.3	7.7	3.6	6.0
mx G	Extract 10 erupted mandib teeth, 60yo M on Persantine, etc.	30.3	31.7	43.5	5.4	4.7	5.8
mx J	Excision of 0.5 cm benign lesion of the lip in a 60yo F	21.9	16.4	30.5	4.7	5.0	5.9
mx O	Unilat Caldwell-Luc proc, etc., w antral polyp remov	62.6	52.4	68.9	4.0	4.3	4.7
ob *	Diagnostic D&C for menometrorrhagia in 50 yo F	43.1	12.6	41.4	4.7	4.7	4.5
ob A	Init off eval secondary amenorrhea, 22 yo new pt, etc.	6.6	27.3	13.9	10.5	3.8	5.3
ob B	Limited prenatal foll-up visit, hx and exam, etc.	5.0	10.0	6.7	10.6	4.8	10.1
ob J	Abdominal hysterectomy, cancer in situ of cervix, 50 yo	57.3	89.0	96.0	5.3	3.5	4.7
op *	1x chalazion proc, excision, left upper lid	21.4	13.7	13.7	6.6	4.6	11.7
op E	Secondary lens implant, wo vitrectomy	78.2	38.8	100.0	5.7	4.2	6.1
op J	Extracapsular cataract extract w IOL	78.9	52.9	111.1	5.1	3.5	6.1
or *	Decompression carpal tunnel, 48yo F, unilat, ambulatory surg	50.9	26.9	60.3	5.2	3.7	4.6
or F	Open reduction and int fixation, intertrochanteric fx 80yo F	84.3	74.1	147.5	4.0	3.9	4.8

Table 56 continued

Survey estimates of pre-, intra-, and post-service time: Mean and standard error as a percent of the mean

First national survey of physicians

Specialty/Service description		Mean of survey estimates of service time[1]			Standard error as a percent of the mean[2]		
		Pre-	Intra-	Post-	Pre-	Intra-	Post-
or M	Closed reduction, subluxation head radius, 4yo M, off setting	17.1	9.6	29.5	7.9	10.5	7.7
ot *	Tonsillectomy and adenoidectomy in 10yo child	47.0	30.0	42.2	4.5	4.0	6.1
ot L	Parotidectomy, lateral lobe, dissection, etc.	64.5	155.7	82.5	4.8	2.9	5.5
ot R	Closed reduction nasal fx, stabilization, post trauma 20yo M	44.4	25.5	30.3	5.3	4.4	8.1
pa F	Interp of serum immunoelectrophoresis	5.8	7.2	8.2	12.5	8.1	10.5
pa O	Exam of a changing melanocytic lesion in a 26yo F	5.4	20.4	10.1	11.1	6.0	8.9
pa Q	Exam of D&C for bleeding in a postmenopausal F	4.9	12.3	7.9	10.5	5.6	9.4
pe C	Comp well child visit at 6 months, est pt (AAP Guidelines)	3.5	17.3	5.7	8.3	3.3	8.5
pe E	Comp well child visit at 5 years, new pt (AAP Guidelines)	7.4	23.9	9.5	7.3	3.4	5.6
pe G	Hosp adm for 18 month old child w 10% dehydration	7.9	46.1	19.4	10.2	5.2	5.2
py G	Ov, term 66yo business executive 2x weekly psychother, etc.	6.0	49.7	9.6	15.2	1.3	14.7
py M	Ov diag interview & eval 17yo M, personality change, etc.	26.6	65.8	37.4	7.0	3.0	7.5
py N	Off consult psych eval 65yo M, intellect deterioration, etc.	27.3	62.5	36.4	6.6	3.0	6.8
ra *	Upper GI series, air contrast technique, KUB abd pain, etc.	4.8	17.1	5.9	8.5	4.9	9.2
ra N	Venography, unilat, complete proc, poss vein thrombosis, etc.	8.6	28.0	8.6	7.1	4.2	7.3
ra Q	Interp lumbar spine x-rays, complete radiograph exam, etc.	1.7	5.3	2.7	7.5	7.0	9.3
rh H	Init off eval pt, negative lab and x-ray studies, fibrositis	11.4	50.4	21.0	8.3	2.5	5.9
rh K	Init off eval & mgmt pt, vasculitis and circulation	17.2	70.1	29.9	6.6	2.5	7.0
rh N	Ltd ov, est pt known osteoarthritis and painful swollen knees	3.8	17.3	9.3	9.8	3.1	8.6
ts B	Chest tube insertion for spontaneous pneumothorax, in 20yo	45.2	15.7	69.9	6.2	6.1	6.4
ts D	Primary CABGx3, 65yo M, etc., no complicating assoc disease	94.9	201.3	203.7	4.1	2.8	5.3
ts H	Left upper pulm lobectomy, for squamous bronchogenic ca	96.1	128.8	173.3	4.6	3.4	4.6
ur *	Diag cystoscopy hosp, ambulatory surg, M w microhematuria	46.4	13.3	42.5	5.4	5.9	5.1
ur H	Transurethral resection of prostate, TURP, etc., BPH 70yo M	77.4	62.4	91.2	4.3	2.8	4.1
ur L	Percutaneous nephrostolithotomy, 1 stage, 2 cm stone or less	90.1	114.4	105.1	5.2	4.0	4.8

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[1] Reported mean is the antilogarithm of the mean of the common logarithm of time.

[2] Standard error is the approximate standard error as a percentage of the mean survey time (see section 5.2.3 for details).

Table 57

Survey estimates of pre-, intra-, and post-service time: Mean and standard error as a percent of the mean

Second national survey of physicians (excluding pathology)

Specialty/Service description		Mean of survey estimates of service time[1]			Standard error as a percent of the mean[2]		
		Pre-	Intra-[3]	Post-	Pre-	Intra-[3]	Post-
ai *	Foll-up ov for pharmacological mgmt of 30yo F w hay fever	3.9	14.8	5.4	12.6	3.6	12.1
ai A	Intracut, intradermal, tsts insects, immed react, 11-15 tsts	17.2	49.9	21.2	14.1	9.6	8.6
ai B	OV, est pt, 6yo child w sore throat and headache	3.0	15.5	5.9	12.3	3.9	11.8
ai C	Percutaneous tsts w allergenic extracts (1st 30)	7.6	22.1	13.1	12.5	7.0	13.3
ai D	Intradermal tsts w allergenic extracts (1st 10)	8.8	20.9	12.1	11.0	7.0	12.5
ai E	Dir hosp adm, yng adlt pt, failed prev ther, asthmtic attack	11.0	72.0	23.7	9.4	4.6	9.0
ai F	Init ov for eval of child w chronic wheezing	6.4	56.9	18.8	17.0	3.6	9.0
ai G	1x inj for immunother, antigen supp by another source	4.4	7.9	3.7	10.8	10.0	18.1
ai I	Fibroscopic exam nasal, choanal, pharynx for nasal polyps	13.9	18.9	14.2	11.3	7.1	9.7
ai J	Inhalation bronchial challenge tstg w histamine, etc	16.0	49.8	15.6	11.3	12.3	10.0
ai L	Eval of 6yo M w mult infs, new pt	7.0	60.2	20.2	17.0	3.8	10.4
ai M	A&R of intradermal tsts w antigens, immune deficiency eval	8.3	23.2	13.6	13.4	7.7	10.6
ai N	Init off eval of adlt w chronic recurrent hives, new pt	6.3	57.2	17.0	15.4	3.7	10.4
ai O	OV 45yo M, est pt, chronic asthma, on chronic steroid, etc	5.3	24.7	8.0	12.2	3.5	11.2
ai P	Med conf w pt. and/or family, counseling for avoidance, etc	6.7	36.8	7.8	12.6	3.7	14.6
ai R	Dir hosp adm of 62yo smoker, est pt, respiratory distress	9.7	77.4	25.6	9.1	4.5	8.9
gs *	Uncomplicated indir inguinal hernia rep, 45yo M	49.6	41.5	47.1	8.5	3.3	10.7
gs B	Chest tube insertion for spontaneous pneumothorax in 20yo	27.7	14.9	60.0	12.1	5.5	11.4
gs D	Modified radical mastectomy	65.2	103.4	91.1	7.0	3.3	12.5
gs E	Tracheostomy, emerg proc, transtracheal, in adlt, etc.	6.6	20.9	23.0	17.0	6.9	12.2
gs G	Low anterior resection for rectal CA	73.8	152.8	119.0	7.0	2.5	11.3
gs H	Appendectomy, acute abd w unperforated appendicitis	56.6	36.8	50.3	7.3	4.0	9.1
gs I	Rigid sigmoidoscopy, wo biopsy, in off	10.2	12.0	11.8	13.7	5.2	11.2
gs J	Colonoscopy and polypectomy, 53yo M, etc., outpt	40.9	52.4	18.5	13.0	6.7	15.0
gs K	Cholecystectomy for cholelithiasis	58.5	64.8	75.0	7.1	3.4	12.8
gs L	Abdominal hysterectomy, cancer in situ of cervix, 50yo F	67.2	86.3	85.5	10.7	3.8	19.3
gs O	Preoperative eval new pt w primary hyperparathyroidism	15.7	47.0	28.0	18.4	6.1	14.4
gs P	Comp ov, init eval 48yo M recurrent low back pain to leg	8.1	34.4	17.6	19.5	5.1	15.3
gs Q	Foll-up ov, 60yo est pt 8 weeks post partial colectomy, etc.	3.3	13.0	4.6	15.3	4.7	15.3
gs S	Off eval new onset right lower quad pain in 32yo F, est pt	4.9	26.2	17.3	17.2	4.0	11.8

Table 57 continued

Survey estimates of pre-, intra-, and post-service time: Mean and standard error as a percent of the mean

Second national survey of physicians (excluding pathology)

		Mean of survey estimates of service time[1]			Standard error as a percent of the mean[2]		
Specialty/Service description		Pre-	Intra-[3]	Post-	Pre-	Intra-[3]	Post-
gs T	Hosp adm, 45yo F w acute cholecystitis	8.0	38.3	19.2	18.7	4.6	10.4
gs U	Hosp visit, 3 days post uncomplicated cholecystectomy, etc.	3.5	11.1	4.4	15.0	4.6	15.5
gs V	Init eval mgmt mult trauma pt w complex pelvic fx, 35yo M	12.6	58.7	34.3	16.2	5.9	10.5
gs W	Emerg hosp consult, 72yo, new pt, poss bowel obstruction	12.5	42.6	23.4	8.5	3.9	11.3
gs Y	Triage, resus and hosp adm from ER, 52yo, alcoholic, etc.	11.7	72.2	37.4	18.4	5.5	10.5
im *	Foll-up visit 55yo M, mgmt hypertension, beta/thiazide	2.7	15.6	5.9	11.8	2.7	9.7
im A	Mgmt pt acute pulm edema in ER, subsequently adm hosp, est pt	10.2	66.1	31.0	9.7	4.4	9.4
im B	Ov, sore throat, fever, fatigue 19yo college student, est pt	1.3	13.8	4.3	7.9	4.1	10.1
im F	Init off eval, diagnosis and mgmt hematuria, etc.	1.7	35.2	11.6	12.2	4.7	8.1
im G	Emerg hosp consult, 72yo, new pt, w poss bowel obstruction	8.2	57.9	23.2	13.9	4.0	8.0
im H	Off eval, poss purulent conjunctivitis 16yo F, est pt	1.2	12.4	4.0	7.1	4.5	11.0
im I	Ov 45yo M, est pt, chronic asthma, on chronic steroid, etc.	2.9	17.4	5.2	11.2	2.6	11.6
im J	Off eval new onset right lower quad pain in 32yo F, est pt	2.7	29.0	11.5	12.4	3.8	9.9
im L	Off eval 28yo pt regional enteritis, diarrhea, est pt	3.8	26.2	11.6	11.3	3.6	10.4
im M	Dir hosp adm of 62yo smoker, est pt, respiratory distress	6.1	51.7	21.4	13.5	4.4	9.0
im N	Foll-up hosp visit, day 2, pt non-dominant CVA, etc.	5.2	17.6	7.2	11.6	3.6	11.0
im O	Hosp visit, day 3 post adm, 65yo M uncomplicated MI, est pt	5.1	18.1	6.9	11.4	3.5	11.6
im P	Sched monthly NH visit to est pt w Organic Brain Syndrome	4.8	15.4	6.6	11.5	3.7	10.6
im Q	NH visit, unsched, for eval pt w fever and obtundation, etc.	9.7	37.6	17.0	8.8	4.3	9.6
im R	Hosp consult for diagnosis/mgmt of fever foll abdominal surg	12.8	48.4	19.3	9.3	3.2	9.6
im S	Init eval and mgmt of recurrent urinary tract inf in F	3.3	25.9	9.3	15.4	4.8	10.4
mx *	Expos 1x impact cuspid, off, 14yo future ortho tx, etc.	11.8	25.0	9.1	8.3	3.6	8.6
mx A	LeFort 1 maxill and sagit split mandib osteotomies, etc.	134.4	255.7	170.6	9.7	3.0	8.6
mx B	Ov to advise remov wisdom teeth, 18yo M, etc.	4.7	16.4	6.4	13.5	4.1	12.3
mx C	Remov 4 impact (full bony) wisdom teeth, 1x off proc, 21yo M	12.2	41.7	9.4	8.4	3.4	8.3
mx D	Remov 4 impact (full bony) wisdom teeth, 1x hosp proc, 21yo M	56.1	49.4	53.2	5.8	3.5	6.3
mx F	Gen anesth extract abscessed tooth in healthy 40yo M	10.7	13.2	8.1	7.5	6.7	10.8
mx G	Extract 10 erupted mandib teeth, 60yo M on Persantine, etc.	58.9	31.7	59.6	5.2	4.7	7.5
mx H	Extract of abscessed tooth in a healthy 40yo M	7.4	10.0	6.5	8.7	7.6	9.4
mx I	Bilat sagitt osteotomy, mandib ramus 20yo F, etc.	122.0	138.5	130.1	8.5	3.0	7.1

Table 57 continued

Survey estimates of pre-, intra-, and post-service time: Mean and standard error as a percent of the mean

Second national survey of physicians (excluding pathology)

Specialty/Service description		Mean of survey estimates of service time			Standard error as a percent of the mean^2		
		Pre-	Intra-^{3}	Post-	Pre-	Intra-^{3}	Post-
mx J	Excision of 0.5 cm benign lesion of the lip in a 60yo F	10.0	16.4	9.6	7.8	5.0	8.2
mx K	Comp eval 28yo F, 2 year hx facial/TMJ pain, etc.	9.3	41.6	20.2	11.7	3.9	10.4
mx L	Ov 45yo F smoker w small oral ulcer on lateral border tongue	4.2	18.5	10.6	12.9	4.5	10.8
mx M	Gen anesth, off extract 4 wisdom teeth healthy 18yo M, etc.	12.0	45.1	10.1	9.0	4.2	11.5
mx O	Unilat Caldwell-Luc proc, etc., w antral polyp remov	58.9	52.4	69.0	5.2	4.3	8.2
mx P	Closed reduction mandib fx by manipulation, etc.	68.0	64.4	77.6	5.6	3.2	6.4
mx Q	Open surgical tx, complex mandib fx, etc.	79.9	131.2	131.8	6.4	2.9	6.0
mx T	Open tx, mult fx zygomatic arch and malar tripod, etc.	80.1	122.6	131.0	5.9	4.0	6.0
mx U	Unilat arthroscopy of temperomandibular joint	90.6	51.3	37.7	10.0	5.2	12.2
mx V	Placement of 4 maxill endosseous implants	73.2	96.8	28.9	7.3	3.7	8.9
mx W	Unilat meniscoplasty, temporomandibular joint	94.6	113.9	38.8	8.2	2.9	8.9
or *	Decompression carpal tunnel, 48yo F, unilat, ambulatory surg	53.8	26.9	20.1	7.4	3.7	6.6
or A	Primary tot hip replacement for osteoarthritis	76.3	129.9	144.6	6.6	2.9	8.6
or B	Day 3 or 4 post-op foll-up, 80yo F, rep intertrochanteric fx	4.8	10.1	6.2	13.0	5.0	12.4
or C	Bunionectomy, Keller/McBride/Mayo type, 45yo F, etc.	53.0	56.6	20.4	7.8	3.0	7.1
or D	Arthroscopic partial menisectomy, 22yo M, knee trauma, etc.	52.7	66.7	19.8	7.7	3.8	7.1
or E	Unilat lumbar laminectomy, excision intervertebral disc, etc.	71.9	84.8	96.0	8.1	3.6	9.3
or F	Open reduction and int fixation, intertrochanteric fx 80yo F	71.1	74.1	138.4	5.7	3.9	9.1
or G	Reduction unstable closed comminuted fx distal radius, etc.	56.8	58.4	20.2	7.9	4.3	8.2
or H	Comp init off visit for eval 13yo F w progressive scoliosis	4.0	29.3	11.4	21.5	3.6	9.3
or I	Comp ov, init eval 48yo man recurrent low back pain to leg	5.1	28.9	13.9	21.5	4.0	10.0
or J	Init eval, mgmt mult trauma pt, complex pelvic fx, 35yo M	40.9	53.4	18.5	13.0	6.6	15.0
or K	Intermed ov, est pt known osteoarthritis and swollen knees	3.2	16.5	8.7	7.1	3.6	12.8
or M	Closed reduction, subluxation head radius, 4yo M, off setting	6.9	9.6	9.2	15.6	10.5	9.6
or N	1st visit eval and counseling 28yo M runner, knee/calf pain	2.4	22.7	8.4	17.4	3.9	13.7
or R	Aspiration of synovial fluid from knee, off proc	9.2	11.4	9.7	9.4	5.5	8.7
or T	Laminectomy, decompression spinal cord, cauda equina, etc.	77.9	155.0	122.1	7.6	2.9	8.9
ts *	Permanent single chamber cardiac pacemaker implantation, etc.	54.9	46.8	70.4	8.8	4.4	10.1
ts A	Redo CABGx3, 1st reop 68yo M, 3 yr post graft, etc.	88.4	283.8	251.3	6.5	2.7	8.2
ts B	Chest tube insertion for spontaneous pneumothorax, in 20yo	31.5	15.7	75.3	11.4	6.1	10.6

Table 57 continued

Survey estimates of pre-, intra-, and post-service time: Mean and standard error as a percent of the mean

Second national survey of physicians (excluding pathology)

		Mean of survey estimates of service time[1]			Standard error as a percent of the mean[2]		
Specialty/Service description		Pre-	Intra-[3]	Post-	Pre-	Intra-[3]	Post-
ts C	Foll-up hosp visit, day 1 post-op chest tube insertion, etc.	7.3	9.1	7.8	16.9	4.9	17.4
ts D	Primary CABGx3, 65yo M, etc., no complicating assoc disease	85.1	201.3	217.8	7.4	2.8	8.4
ts E	Hosp visit, day 2 post-op, CABGx3, 65yo M, no assoc disease	7.3	13.5	7.8	10.8	5.3	14.0
ts F	Init hosp eval pulm tumor 45yo smoker, prev in good health	17.9	38.2	16.5	12.5	4.6	12.5
ts G	Primary diag fiberoptic bronchoscopy, bronchopulm lesion	44.3	29.6	43.0	8.8	5.3	10.9
ts H	Left upper pulm lobectomy, for squamous bronchogenic ca	76.8	128.8	186.9	6.3	3.4	7.8
ts I	Prosth graft repl 10 cm abd infrarenal aortic aneurysm, etc.	82.2	164.4	205.8	7.9	3.4	9.3
ts J	Mediastinoscopy in pt w suspected paratracheal lymph nodes	53.1	45.0	59.2	7.5	4.2	11.4
ts K	Ext init off eval of 70yo F w increasing dysphagia	13.0	39.2	17.6	15.0	4.3	11.5
ts L	Thoracentesis, tot evac, effusion and suspected pulm tumor	39.3	26.3	47.6	10.0	4.5	9.8
ts M	Init pericardiocentesis, 35yo M post chest trauma	28.2	24.6	78.5	12.8	6.4	15.7
ts N	Init off eval 50yo M w aortic aneurysm, to recommend surg	12.1	35.8	17.8	12.6	4.4	12.3
ts O	Carotid endarterectomy, unilat, 58yo F, hx ischemic attacks	64.8	92.4	91.0	8.7	4.4	11.3
ts R	Tracheostomy, emerg proc, transtracheal, in adlt, etc.	7.0	23.3	21.6	20.0	7.1	11.7
ts S	Tot esophagectomy w gastroesophageal anastomosis in chest	85.3	244.2	253.0	7.5	3.1	7.6
ts T	Primary aortic valve repl 50yo F, prosth valve, etc.	83.9	189.8	211.1	6.8	2.9	8.1
ts U	Eval 65yo M,chronic stable angina and coronary artery disease	14.3	35.9	15.0	14.5	4.6	13.4

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[1] Reported mean is the antilogarithm of the mean of the common logarithm of time.

[2] Standard error is the approximate standard error as a percentage of the mean survey time (see section 5.2.3 for details).

[3] Reported mean and standard error for intra-service times are estimates from the first survey.

Table 58

Survey estimates of pre-, intra-, and post-service time: Mean and standard error as a percent of the mean

Second national survey of pathologists

Specialty/Service description			Mean of survey estimates of total-service time[1]	Standard error as a percent of the mean[2]
pa	*	Exam of a gall bladder removed for cholelithiasis	11.2	6.7
pa	A	Exam of a tot laryngectomy etc., CA of larynx, etc.	86.0	5.3
pa	B	Exam two segments vas deferentia, etc., to induce sterility	5.7	8.6
pa	C	Exam frozen section breast biopsy, 2-3 cm, 34yo F, etc.	27.5	5.5
pa	E	Exam acid fast stained slide, etc., lesion of lymph node	20.8	6.5
pa	F	Interp of serum immunoelectrophoresis	10.5	9.3
pa	G	Cytologic exam of a bronchial aspirate	20.0	5.3
pa	H	Interp peripheral blood smear showing atypical lymphocytes	12.2	6.9
pa	I	Exam posterior cervical lymph node biopsy, 46yo M, etc.	32.7	6.8
pa	J	Interp of fine needle aspirate of the prostate, 10 smears	35.1	6.1
pa	K	Consult in an intrapartum bleeding diathesis	39.5	7.3
pa	L	Exam mult endoscopically remov biopsies, etc., pt w colitis	23.6	6.6
pa	M	Exam hysterectomy and salpingo-oophorectomy, 57yo F, etc.	40.0	5.3
pa	N	Consult for transfusion react in pt w fever and back pain	33.8	6.9
pa	O	Exam of a changing melanocytic lesion in a 26yo F	28.6	5.5
pa	P	Interp of L/S ratio for fetal maturity	9.0	12.1
pa	Q	Exam of D&C for bleeding in a postmenopausal F	18.1	5.8
pa	R	Clinical path consult, ltd-crystal analysis synovial fluid	13.4	6.7

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[1] Reported mean is the antilogarithm of the mean of the common logarithm of time.

[2] Standard error is the approximate standard error as a percentage of the mean survey time (see section 5.2.3 for details).

Table 59

Comparison of pre- and post-service time estimates for physicians who responded to both surveys (group 2) versus those who responded to the first survey only (group 1)

Specialty		Service description	Group 1		Group 2		
			Mean pre-service time	Percent standard error pre-service time	Mean pre-service time	Percent standard error pre-service time	Significance probability T-statistic
Pre-service							
ai	*	Foll-up ov for pharmacological mgmt of 30yo F w hay fever	6	10.9	7	14.5	0.1561
ai	B	OV, est pt, 6yo child w sore throat and headache	4	12.3	4	16.0	0.8626
ai	O	OV 45yo M, est pt, chronic asthma, on chronic steroid, etc	7	10.8	8	12.0	0.1560
gs	*	Uncomplicated indir inguinal hernia rep, 45yo M	38	7.6	31	13.2	0.1561
gs	G	Low anterior resection for rectal CA	74	7.7	61	8.5	0.0829
gs	K	Cholecystectomy for cholelithiasis	52	8.1	48	8.4	0.4119
im	*	Foll-up visit 55yo M, mgmt hypertension, beta/thiazide	5	14.3	4	11.9	0.2472
im	B	Ov, sore throat, fever, fatigue 19yo college student, est pt	3	15.8	3	13.7	0.3962
im	L	Off eval 28yo pt regional enteritis, diarrhea, est pt	6	9.9	6	11.8	0.6697
mx	G	Extract 10 erupted mandib teeth, 60yo M on Persantine, etc.	20	8.8	19	7.7	0.6974
mx	J	Excision of 0.5 cm benign lesion of the lip in a 60yo F	14	6.9	14	6.8	0.8194
mx	O	Unilat Caldwell-Luc proc, etc., w antral polyp remov	47	7.0	41	6.5	0.1716

Table 59 continued

Comparison of pre- and post-service time estimates for physicians who responded to both surveys (group 2) versus those who responded to the first survey only (group 1)

			Group 1		Group 2		
Specialty		Service description	Mean pre-service time	Percent standard error pre-service time	Mean pre-service time	Percent standard error pre-service time	Significance probability T-statistic
Pre-service							
or	*	Decompression carpal tunnel, 48yo F, unilat, ambulatory surg	23	14.6	20	19.7	0.6259
or	F	Open reduction and int fixation, intertrochanteric fx 80yo F	48	6.2	45	6.8	0.3951
or	M	Closed reduction, subluxation head radius, 4yo M, off setting	14	9.1	13	11.0	0.8079
pa	F	Interp of serum immunoelectrophoresis	7	21.8	5	15.8	0.2189
pa	O	Exam of a changing melanocytic lesion in a 26yo F	6	19.7	5	13.8	0.2425
pa	Q	Exam of D&C for bleeding in a post-menopausal F	6	17.5	5	13.5	0.3159
ts	B	Chest tube insertion for spontaneous pneumothorax, in 20yo	32	8.3	27	12.1	0.2448
ts	D	Primary CABGx3, 65yo M, etc., no complicating assoc disease	50	6.2	56	8.0	0.2841
ts	H	Left upper pulm lobectomy, for squamous bronchogenic ca	58	8.0	56	9.2	0.8141

Table 59 continued

Comparison of pre- and post-service time estimates for physicians who responded to both surveys (group 2) versus those who responded to the first survey only (group 1)

			Group 1		Group 2		
Specialty		Service description	Mean post-service time	Percent standard error post-service time	Mean post-service time	Percent standard error post-service time	Significance probability T-statistic
Post-service							
ai	*	Foll-up ov for pharmacological mgmt of 30yo F w hay fever	10	11.5	12	11.3	0.3110
ai	B	OV, est pt, 6yo child w sore throat and headache	8	12.2	11	12.4	0.1462
ai	O	OV 45yo M, est pt, chronic asthma, on chronic steroid, etc	13	8.9	14	8.0	0.5627
gs	*	Uncomplicated indir inguinal hernia rep, 45yo M	48	8.2	49	8.5	0.8795
gs	G	Low anterior resection for rectal CA	184	6.0	155	6.4	0.0495
gs	K	Cholecystectomy for cholelithiasis	112	6.2	94	6.9	0.0594
im	*	Foll-up visit 55yo M, mgmt hypertension, beta/thiazide	8	13.6	7	10.5	0.7635
im	B	Ov, sore throat, fever, fatigue 19yo college student, est pt	8	12.8	8	11.9	0.7743
im	L	Off eval 28yo pt regional enteritis, diarrhea, est pt	12	9.2	13	8.0	0.5217
mx	G	Extract 10 erupted mandib teeth, 60yo M on Persantine, etc.	46	8.6	42	8.1	0.4017
mx	J	Excision of 0.5 cm benign lesion of the lip in a 60yo F	33	8.9	29	8.0	0.3103
mx	O	Unilat Caldwell-Luc proc, etc., w antral polyp remov	71	7.9	67	5.9	0.5211

Table 59 continued

Comparison of pre- and post-service time estimates for physicians who responded to both surveys (group 2) versus those who responded to the first survey only (group 1)

			Group 1		Group 2		
Specialty		Service description	Mean post-service time	Percent standard error post-service time	Mean post-service time	Percent standard error post-service time	Significance probability T-statistic
Post-service							
or	*	Decompression carpal tunnel, 48yo F, unilat, ambulatory surg	65	6.2	55	6.8	0.0699
or	F	Open reduction and int fixation, intertrochanteric fx 80yo F	149	6.6	146	7.2	0.8375
or	M	Closed reduction, subluxation head radius, 4yo M, off setting	30	11.1	29	10.9	0.7952
pa	F	Interp of serum immunoelectrophoresis	9	20.6	8	12.4	0.6959
pa	O	Exam of a changing melanocytic lesion in a 26yo F	12	16.0	9	10.7	0.1800
pa	Q	Exam of D&C for bleeding in a postmenopausal F	9	16.0	7	11.8	0.1921
ts	B	Chest tube insertion for spontaneous pneumothorax, in 20yo	69	8.0	71	11.0	0.8000
ts	D	Primary CABGx3, 65yo M, etc., no complicating assoc disease	203	6.6	205	9.3	0.9048
ts	H	Left upper pulm lobectomy, for squamous bronchogenic ca	171	5.7	177	8.4	0.7377

Table 60

Evaluation and management services surveyed in the first national survey and not surveyed in the second national survey: Surveyed and adjusted pre- and post-service times

		Time in minutes			
		Pre-service		Post-service	
Specialty	Service description	Surveyed	Adjusted	Surveyed	Adjusted
dm	G Off revisit, eval 28 yo male,onychomycosis	2.5	1.8	4.3	3.0
dm	J Init OV, 16 yo male w severe cystic acne	2.9	2.1	7.3	5.1
dm	T Init comp eval, 30 yo woman w sympts SCLE	5.9	4.1	11.8	8.2
fp	L OV, est pt, 6 yo, sore throat & headache	2.8	2.0	5.4	3.8
fp	M Off eval, ? purulent conjnctivtis, 16 yo f	2.1	1.4	4.1	3.4
fp	P Off eval of new onset pain in 32 yo woman	4.3	3.5	13.5	12.7
ob	A Init off eval of scndry amenorrhea, etc	6.6	4.6	13.9	9.7
ob	B Lim prenatal fol-up, hx & exam, etc	5.0	3.5	6.7	4.7
pe	C Comp well child visit at 6 months,est pt	3.5	2.5	5.7	4.0
pe	E Comp well child visit at 5 yrs, new pt	7.4	5.2	9.5	6.6
pe	G Hosp adm 18 mth old child w 10% dehydr	7.9	5.6	19.4	13.6
py	G OV, terminate 66 yo bus exec from 2/week psyc	6.0	4.2	9.6	6.7
py	M OV, diagn interview & eval 17 yo male w/p	26.6	18.6	37.4	26.2
py	N Off psych eval, 65 yo m w/intell deterior.	27.3	19.1	36.4	25.5
rh	H Init office eval of pt w ? of fibrositis	11.4	8.0	21.0	14.7
rh	K Init off.eval and mngmnt pt w vasculitis	17.2	12.1	29.9	20.9
rh	N OV, est pt, osteoarthritis, swollen knees	3.8	2.7	9.3	6.5

Table 61

Predicting mean pre- and post-service time using mean intra-service work and mean intra-service time: Results of a test for the equality of regression models from different service classes

		Residual			Residual		
Service class	N	Degrees of freedom	Sum of squares	F-statistic[1]	Degrees of freedom	Sum of squares	F-statistic[1]
Office evaluation and management and imaging	44	41	1.53212		41	0.56243	
Hospital and emergency room evaluation and management	19	16	0.36785		19	0.14390	
Office, hospital and emergency room evaluation and management and imaging	63	60	2.31891	4.19**	63	0.78102	2.01
Office invasive	14	11	0.08909		11	0.19569	
Surgical center invasive	12	9	0.10235		9	0.19223	
Hospital invasive	38	35	0.24300		35	0.44314	
Office and surgical center invasive	26	23	0.46502	9.52**	23	0.93564	9.41**
Surgical center and hospital invasive	49	46	0.37515	1.24	46	2.43830	40.80**

[1] F-statistic is the result of a test of the equality of the parameters of two regression models. For example, the F-statistic of 1.24 for the pre-service time for surgical center and hospital invasive services is the result of a test of the difference between the parameters of the separate models for surgical center and hospital invasive services.

** Statistically significant at the 5 percent level.

Table 62

Predicting mean pre- and post-service time using mean intra-service work and mean intra-service time (regression statistics)

Service class	Number of services	Parameter estimates (t-statistics) Intercept	Intra-service work	Intra-service time	R-squared	Model F-statistic	"Smearing" factor
Pre-service time							
Office evaluation and management and imaging	44	-0.862** (-3.05)	0.442 (1.10)	0.494 (1.26)	0.618	33.1**	9.27%
Hospital and emergency unit evaluation and management	19	-0.412 (-1.31)	0.973** (2.70)	-0.446 (-1.32)	0.573	10.7**	5.77
Office invasive	14	0.151 (0.83)	0.265 (1.52)	0.259 (1.41)	0.726	14.6**	1.68
Hospital and surgical center invasive	49	0.587** (5.86)	0.387** (3.61)	-0.030 (-0.24)	0.740	66.9**	2.10

** Statistically significant at the 5 percent level.

Table 62 continued

Predicting mean pre- and post-service time using mean intra-service work and mean intra-service time (regression statistics)

		Parameter estimates (t-statistics)					
Service class	Number of services	Intercept	service work	service time	R-squared	Intra- Model F-statistic	Intra- "Smearing" factor
Post-service time							
Office, hospital, and emergency unit evaluation and management and imaging	62	-0.651** (-5.34)	0.576** (3.54)	0.386** (2.38)	0.853	174.6**	3.29
Office invasive unit evaluation and management	14	0.282 (1.07)	0.124 (0.47)	0.395 (1.46)	0.538	6.4**	3.46
Surgical center invasive	12	0.908** (2.94)	0.992** (2.62)	-1.209 (-2.59)	0.435	3.5	4.38
Hospital invasive	38	0.573** (3.61)	0.390** (2.54)	0.168 (0.96)	0.766	57.2	3.22

** Statistically significant at the 5 percent level.

Table 63

Predicting mean pre- and post-service time using regression analysis and individual service data (regression statistics)

Anesthesia
parameter estimates (t-statistics)

Intercept	Intra-service work	Intra-service time	R-squared	Model F-statistic	"Smearing" factor
Pre-service time					
.278	.061	.442	.356	90.6**	1.37
Post-service time					
-.222	.189	.606	.426	119.0**	8.40

Statistically significant at the 5 percent level.

Table 64

Estimates of pre-, intra-, and post-service time from survey and prediction[1]

Specialty	Fill[2]	Service description	Time in minutes Pre-service	 Intra-service	 Post-service	Percentage pre and post of total service time
Office evaluation and management services						
py K	5	Group med psychother in-off, 6 pts seen weekly, etc.	4.2	77.6	6.7	12
py S	5	Ov diag reeval 68yo F, chronic depression, unresponsive tx	4.2	50.0	6.7	18
py U	5	Ov individ psychoanalysis 42yo, passive-aggressive, etc.	4.2	49.9	6.7	18
py G	2	Ov, term 66yo business executive 2x weekly psychother, etc.	4.2	49.8	6.7	18
py C	5	Foll-up psychother ov, 48yo housewife for tx of agoraphobia	4.2	46.0	6.7	19
py *	5	2nd ov after referral from internist, 25yo M panic attacks	4.2	43.7	6.7	20
py H	5	Weekly med psychother and pharmacother ov, 36yo F, etc.	4.2	41.9	6.7	21
pe T	5	Phone call during off hours for child w rash on Amoxicillin	0.0	4.8	1.7	26
im V	5	Off phone consult re: poss adverse drug react in est pt	0.0	7.9	2.9	27
pe J	5	2:00 A.M. phone call for crying child under 12 months	0.0	7.4	2.7	27
py O	5	Ov chemother for mgmt of 44yo M w bipolar depression	4.2	29.1	6.7	27
dm J	2	Init ov, 16yo M w severe cystic acne, new pt	2.1	19.0	5.1	27
fp W	3	Comp well child visit at 6 months, est pt (AAP guidelines)	2.5	17.1	4.0	27
pe C	2	Comp well child visit at 6 months, est pt (AAP Guidelines)	2.5	17.1	4.0	27
fp X	5	Phone consult, pt home, 1:30 A.M., belching, etc.	0.0	9.2	3.5	27
im F	2	Init off eval, diagnosis and mgmt hematuria, etc.	1.7	35.2	11.6	27
im W	5	Phone consult pt home, 1:30 A.M., belching, etc.	0.0	12.7	4.8	28
ai P	2	Med conf w pt. and/or family, counseling for avoidance, etc	6.7	36.8	7.8	28
ai N	2	Init off eval of adlt w chronic recurrent hives, new pt	6.3	57.0	17.0	29
im B	2	Ov, sore throat, fever, fatigue 19yo college student, est pt	1.3	13.1	4.3	30
ot B	3	Ov, sore throat, fever, fatigue, 19yo college student, est pt	1.3	13.1	4.3	30
fp M	2	Off eval, poss purulent conjunctivitis 16yo F, est pt	1.4	11.1	3.4	30
im H	2	Off eval, poss purulent conjunctivitis 16yo F, est pt	1.4	11.1	3.4	30
pe R	3	Off eval, poss purulent conjunctivitis 16yo F, est pt	1.4	11.1	3.4	30
ai F	2	Init ov for eval of child w chronic wheezing	6.4	56.9	18.8	31
rh H	2	Init off eval pt, negative lab and x-ray studies, fibrositis	8.0	50.5	14.7	31
py B	5	Phone conv, retarded mother of 18yo schizophrenic M, etc.	0.0	14.7	6.6	31
ai L	2	Eval of 6yo M w mult infs, new pt	7.0	60.2	20.2	31
op D	4	Consult/ext eval complex ophthalmic problem, etc.	8.4	52.6	15.7	31
op O	4	Contact lens eval and fitting, incl comp eye exam, etc.	8.8	54.0	16.5	32
rh K	2	Init off eval & mgmt pt, vasculitis and circulation	12.1	70.1	20.9	32

Table 64 continued

Estimates of pre-, intra-, and post-service time from survey and prediction

Specialty	Fill[2]	Service description	Time in minutes			Percentage pre and post of total service time
			Pre-service	Intra-service	Post-service	
Office evaluation and management services						
dm T	2	Init comp eval 30yo F w symptoms of SCLE	4.1	26.1	8.2	32
or N	2	1st visit eval and counseling 28yo M runner, knee/calf pain	2.4	22.7	8.4	32
im T	4	Init off eval of a 37 generally well M	5.7	33.9	10.5	32
fp O	3	Ov 45yo M, est pt, chronic asthma, on chronic steroid, etc.	2.9	16.8	5.2	33
im I	2	Ov 45yo M, est pt, chronic asthma, on chronic steroid, etc.	2.9	16.8	5.2	33
im S	2	Init eval and mgmt of recurrent urinary tract inf in F	3.3	26.1	9.3	33
ur O	3	Init eval and mgmt of recurrent urinary tract inf in F	3.3	26.1	9.3	33
py V	4	Court-requested eval juvenile, attempted rape a 71yo F, etc.	19.0	115.1	37.0	33
op C	4	Comp eye exam, adlt pt w no specific complaints, hx, etc.	4.8	27.9	8.8	33
fp L	2	Ov, est pt, 6yo child w sore throat and headache	2.0	11.7	3.8	33
pe E	2	Comp well child visit at 5 years, new pt (AAP Guidelines)	5.2	24.0	6.6	33
py Q	4	Eval 24yo M, murder, competency to stand trial, etc.	24.2	145.1	47.8	33
py X	4	Prep report to DMH halfway house coord, 3-week hosp, etc.	9.3	53.0	18.0	34
or H	2	Comp init off visit for eval 13yo F w progressive scoliosis	4.0	29.3	11.4	35
ob A	2	Init off eval secondary amenorrhea, 22 yo new pt, etc.	4.6	27.2	9.7	35
dm G	2	Off revisit for eval of 28yo M w onychomycosis	1.8	9.0	3.0	35
fp B	3	Off revisit for eval of 28yo M w onychomycosis	1.8	9.0	3.0	35
rh N	2	Ltd ov, est pt known osteoarthritis and painful swollen knees	2.7	17.2	6.5	35
ot C	4	Init off eval gradual hearing loss, 58yo M, hx, etc.	5.1	27.9	9.7	35
pe B	4	Off eval of diaper dermatitis, est pt	1.3	7.1	2.4	35
op B	4	Foll-up exam, est pt, incl visual acuity, slit lamp, etc.	2.7	14.5	5.1	35
ai O	2	OV 45yo M, est pt, chronic asthma, on chronic steroid, etc	5.3	24.6	8.0	35
rh O	4	Comp init eval 48yo M recurrent back pain radiating to leg	10.0	54.1	19.5	35
py T	4	Ov family psychother, 38yo father incestuous w 12yo daughter	12.3	66.4	24.3	36
py E	4	Eval records and reports, 69yo F, pre-syncopal episodes, etc.	8.7	46.2	17.0	36
op S	4	Off eval poss purulent conjunctivitis 16yo F, est pt	2.3	11.9	4.3	36
rh C	4	Init off eval of 70yo F w polyarthralgia	10.3	54.4	20.2	36
rh *	4	Foll-up ov, etc., Stage II, Class II, rheumatoid arthritis	3.4	17.4	6.4	36
pe O	4	Foll-up visit, adolescent w behavior problem, etc., est pt	5.8	30.0	11.1	36

Table 64 continued

Estimates of pre-, intra-, and post-service time from survey and prediction

Specialty	Fill^2	Service description	Time in minutes Pre-service	 Intra-service	 Post-service	Percentage pre and post of total service time
Office evaluation and management services						
pe F	4	Comp well child visit at 15 years, new pt (AAP Guidelines)	5.3	27.4	10.1	36
gs R	4	Foll-up visit, post tx, pt w primary breast cancer	3.2	16.1	6.0	36
ot S	4	Rhinoplasty eval, 25yo F, incl hx, physical, etc.	6.2	31.9	11.9	36
pe *	4	Ov, est pt, 6yo child w sore throat and headache	2.2	10.8	4.0	36
ai B	2	OV, est pt, 6yo child w sore throat and headache	3.0	15.5	5.9	37
pe D	4	Comp well child visit at 2 years, est pt (AAP Guidelines)	3.7	18.6	7.1	37
pe S	4	Init ov for eval of child w chronic wheezing	5.0	25.3	9.7	37
fp K	4	Init visit pregnancy 25yo primigravida, hx and exam, etc.	7.6	38.8	15.0	37
ob C	4	Init visit pregnancy 25 yo primigravida, hx and exam, etc.	7.6	38.8	15.0	37
dm *	4	Foll-up visit w 48yo M ongoing mgmt psoriasis not PUVA tx	2.1	10.4	4.0	37
pe H	4	Init visit of adolescent F w abd pain, new pt	5.8	29.2	11.4	37
fp N	4	Routine gyn exam, 24yo est pt, wo complaints	3.9	19.2	7.5	37
ob K	4	Routine gyn exam, primary care phys, est pt, wo complaints	3.9	19.2	7.5	37
fp *	3	Foll-up visit 55yo M, mgmt hypertension, beta/thiazide	2.7	14.5	5.9	37
im *	2	Foll-up visit 55yo M, mgmt hypertension, beta/thiazide	2.7	14.5	5.9	37
ob U	4	Init ov eval and counseling 17 yo F w primary genital herpes	5.6	27.6	11.0	38
pe L	4	Poss of sexual abuse in 5yo F, new pt	6.9	34.2	13.7	38
im K	4	Ov eval recent onset syncopal attacks, 70yo F, est pt	7.7	37.8	15.1	38
ob P	4	Ov postpartum care 6 weeks, uncomplicated vaginal delivery	3.3	16.0	6.4	38
dm R	4	Init off eval, adlt w chronic recurrent hives, new pt	4.8	23.3	9.3	38
ur F	4	Init consult for infertility in 35yo M	6.5	31.6	12.8	38
ur G	4	Init off eval diagnosis & mgmt painless gross hematuria, etc.	5.6	27.0	10.9	38
gs Q	2	Foll-up ov, 60yo est pt 8 weeks post partial colectomy, etc.	3.3	12.9	4.6	38
ai *	2	Foll-up ov for pharmacological mgmt of 30yo F w hay fever	3.9	15.2	5.4	38
fp U	4	Off consult psych exam 25yo M, intellect deterioration, etc.	7.8	37.8	15.5	38
ur D	4	Off eval new onset right lower quad pain 32yo F, est pt	5.0	23.7	9.7	38
ot I	4	Eval recurrent dizziness and vertigo 48yo F, incl hx, etc.	5.9	28.0	11.6	38
dm E	4	Init ov, 35yo M w complaint of alopecia	3.7	17.7	7.3	38
fp Y	4	1x supervs conf w nurse, antibiotic ther, est pt w SBE	2.8	13.2	5.4	38
im X	4	1x supervs conf w nurse, antibiotic ther, est pt w SBE	2.8	13.2	5.4	38

Table 64 continued

Table 64 continued

Estimates of pre-, intra-, and post-service time from survey and prediction

Specialty	Fill[2]	Service description	Time in minutes Pre-service	Intra-service	Post-service	Percentage pre and post of total service time
Office evaluation and management services						
rh A	4	Init off eval SLE, fever, seizures and thrombocytopenia	14.3	69.4	29.2	39
rh M	4	Foll up off consult, 45yo M ankylosing spondylitis, etc.	4.7	22.1	9.2	39
ob X	4	Init ov 34 year pt w primary infertility, incl counseling	8.4	40.4	16.9	39
dm C	4	Init ov, eval and counseling 17yo F w primary genital herpes	4.1	19.4	8.0	39
ot N	4	Eval hoarseness and dysphagia, 65yo M incl hx and physical	4.7	21.9	9.2	39
fp P	2	Off eval new onset right lower quad pain in 32yo F, est pt	3.5	25.6	12.7	39
gs S	2	Off eval new onset right lower quad pain in 32yo F, est pt	3.5	25.6	12.7	39
im J	2	Off eval new onset right lower quad pain in 32yo F, est pt	3.5	25.6	12.7	39
ob L	3	Off eval new onset right lower quad pain in 32 yo F, est pt	3.5	25.6	12.7	39
rh J	4	Foll-up visit 40yo mother, Stage III, Class III, etc.	5.9	27.5	11.7	39
fp Q	3	Off eval 28yo pt regional enteritis, diarrhea, est pt	3.8	23.9	11.6	39
im L	2	Off eval 28yo pt regional enteritis, diarrhea, est pt	3.8	23.9	11.6	39
pe I	4	Off eval head trauma, pre-school child w vomiting, est pt	4.3	19.5	8.4	39
ur J	4	Init eval and mgmt of recurrent renal calculi in 40yo M	6.4	29.6	12.9	39
rh I	4	Foll-up visit 45yo, rheumatoid arthritis on gold, etc.	4.3	19.6	8.5	39
ob Z	4	Ov counseling 25yo primigravida, family hx of Downs Syndrome	6.2	28.2	12.4	40
mx B	2	Ov to advise remov wisdom teeth, 18yo M, etc.	4.7	16.4	6.4	40
ai K	4	Prof svcs for supervs and prov antigens, allergen immunother	4.2	18.5	8.4	40
py M	2	Ov diag interview & eval 17yo M, personality change, etc.	18.6	65.9	26.2	40
mx K	2	Comp eval 28yo F, 2 year hx facial/TMJ pain, etc.	9.3	43.3	20.2	41
py N	2	Off consult psych eval 65yo M, intellect deterioration, etc.	19.1	61.8	25.5	42
or K	2	Intermed ov, est pt known osteoarthritis and swollen knees	3.2	16.5	8.7	42
ob D	4	Ext foll-up prenatal visit at 36-37 weeks, etc.	4.0	16.8	8.1	42
gs P	2	Comp ov, init eval 48yo M recurrent low back pain to leg	6.6	31.0	15.7	42
or I	2	Comp ov, init eval 48yo man recurrent low back pain to leg	6.6	31.0	15.7	42
ts K	2	Ext init off eval of 70yo F w increasing dysphagia	13.0	38.4	17.6	44
mx L	2	Ov 45yo F smoker w small oral ulcer on lateral border tongue	4.2	18.5	10.6	44
ob B	2	Limited prenatal foll-up visit, hx and exam, etc.	3.5	10.1	4.7	45
ts U	2	Eval 65yo M,chronic stable angina and coronary artery disease	14.3	35.6	15.0	45
ts N	2	Init off eval 50yo M w aortic aneurysm, to recommend surg	12.1	34.8	17.8	46
gs O	2	Preoperative eval new pt w primary hyperparathyroidism	15.7	50.4	28.0	46

Table 64 continued

Estimates of pre-, intra-, and post-service time from survey and prediction

Specialty	Fill[2]	Service description	Time in minutes Pre-service	Time in minutes Intra-service	Time in minutes Post-service	Percentage pre and post of total service time
Hospital evaluation and management services						
py R	5	1x supervisory conf, team RNs, SWs, andn MHWs, psych unit	4.2	64.3	6.7	14
py I	5	Family psychother, husband of 28yo F, bipolar illness, etc.	4.2	55.5	6.7	16
pe G	2	Hosp adm for 18 month old child w 10% dehydration	5.6	46.2	13.6	29
py J	4	Mult family group med psychother of families, in-pts, etc.	9.7	77.9	25.4	31
ai R	2	Dir hosp adm of 62yo smoker, est pt, respiratory distress	9.7	77.6	25.6	31
ai E	2	Dir hosp adm, yng adlt pt, failed prev ther, asthmtic attack	11.0	71.4	23.7	33
py D	4	Hosp consult, psych eval 68yo surg, post-op depression	9.7	62.5	22.0	34
py W	4	Eval & level care decision 17yo adolescent, schizo, etc.	10.0	63.6	22.6	34
im M	2	Dir hosp adm of 62yo smoker, est pt, respiratory distress	6.1	51.7	21.4	35
im G	2	Emerg hosp consult, 72yo, new pt, w poss bowel obstruction	8.2	57.9	23.2	35
dm P	4	Hosp consult, poss drug eruption, 50yo M	7.1	36.5	12.9	35
an N	4	Eval 63yo pt, ICU w diabetes and chronic renal failure, etc	10.0	52.9	21.2	37
rh D	4	Consult hosp, 35yo F, fever, swelling joints, rash, etc.	12.1	59.4	24.2	38
py F	4	Repeat hosp visit stabilized 42yo M, schizophrenia, etc.	5.4	21.5	7.8	38
an V	4	Consult for transfusion react in pt w fever and back pain	7.8	36.8	15.0	38
fp A	4	Dir hosp adm yng adlt est pt, acute asthma attack	9.9	44.8	18.0	38
im O	2	Hosp visit, day 3 post adm, 65yo M uncomplicated MI, est pt	5.1	18.1	6.9	40
im R	2	Hosp consult for diagnosis/mgmt of fever foll abdominal surg	12.8	48.4	19.3	40
ur S	4	Init eval and mgmt of unexplained renal failure in a 40yo F	10.0	37.9	16.2	41
im N	2	Foll-up hosp visit, day 2, pt non-dominant CVA, etc.	5.2	17.6	7.2	41
gs U	2	Hosp visit, 3 days post uncomplicated cholecystectomy, etc.	3.5	11.0	4.4	42
gs T	2	Hosp adm, 45yo F w acute cholecystitis	8.0	36.9	19.2	42
fp V	3	Emerg hosp consult, 72yo, new pt, w poss bowel obstruction	12.5	44.6	23.4	45
gs W	2	Emerg hosp consult, 72yo, new pt, poss bowel obstruction	12.5	44.6	23.4	45
ur B	4	Foll-up hosp visit 2 days post uncomplicated TURP in 70yo M	4.7	9.7	4.3	48
ts F	2	Init hosp eval pulm tumor 45yo smoker, prev in good health	17.9	36.9	16.5	48
or B	2	Day 3 or 4 post-op foll-up, 80yo F, rep intertrochanteric fx	4.8	10.2	6.2	52
ts E	2	Hosp visit, day 2 post-op, CABGx3, 65yo M, no assoc disease	7.3	12.8	7.8	54
ts C	2	Foll-up hosp visit, day 1 post-op chest tube insertion, etc.	7.3	9.0	7.8	63

Table 64 continued

Estimates of pre-, intra-, and post-service time from survey and prediction

Specialty	Fill^2	Service description	Time in minutes Pre-service	 Intra-service	 Post-service	Percentage pre and post of total service time
Nursing home evaluation and management services						
fp S	4	NH visit, unsched, eval pt w fever and obtundation, etc.	7.5	30.8	13.3	40
im Q	2	NH visit, unsched, for eval pt w fever and obtundation, etc.	9.7	37.6	17.0	42
fp R	3	Sched monthly NH visit to est pt w Organic Brain Syndrome	4.8	15.9	6.6	42
im P	2	Sched monthly NH visit to est pt w Organic Brain Syndrome	4.8	15.9	6.6	42
Emergency evaluation and management services						
fp T	4	Mgmt pt acute pulm edema in ER, subsequent hosp adm, est pt	10.2	56.7	21.3	36
py L	4	Hosp ER eval 78yo F, ingested alcohol and valium, suicide	11.2	60.8	23.5	36
im A	2	Mgmt pt acute pulm edema in ER, subsequently adm hosp, est pt	10.2	66.1	31.0	38
py A	4	ER eval, intervention 25yo M, voices, attempt stab, etc.	15.4	74.2	32.4	39
gs Y	2	Triage, resus and hosp adm from ER, 52yo, alcoholic, etc.	11.7	72.7	37.4	40
gs V	2	Init eval mgmt mult trauma pt w complex pelvic fx, 35yo M	12.6	59.1	34.3	44
or J	2	Init eval, mgmt mult trauma pt, complex pelvic fx, 35yo M	27.6	53.2	18.5	46
Office invasive services						
mx C	2	Remov 4 impact (full bony) wisdom teeth, 1x off proc, 21yo M	12.2	41.6	9.4	34
ai J	2	Inhalation bronchial challenge tstg w histamine, etc	16.0	49.7	15.6	39
op N	4	Panretinal photocoagulation, tot tx, one eye, etc.	22.8	70.0	22.9	39
ai A	2	Intracut, intradermal, tsts insects, immed react, 11-15 tsts	17.2	49.9	21.2	44
op Q	4	Fluorescein angiography diabetic retinopathy, etc., interp	12.1	33.2	13.9	44
mx *	2	Expos 1x impact cuspid, off, 14yo future ortho tx, etc.	11.8	25.0	9.1	46
dm N	4	Excision & intermed rep of 4 by 6 mm BCE of forehead 30yo F	13.5	32.5	14.6	46
ur P	4	Cystometrogram calibrated electronic equipment, etc.	12.1	29.0	13.4	47
dm U	4	Excision of 2 facial nevi, 20yo M, 8 and 4 mms respectively	11.5	26.5	12.8	48
ob N	4	Colposcopy abnorm cervical cytology, Pap smear, w biopsy	12.1	27.5	13.2	48
ai C	2	Percutaneous tsts w allergenic extracts (1st 30)	7.6	22.2	13.1	48
ai M	2	A&R of intradermal tsts w antigens, immune deficiency eval	8.3	23.1	13.6	49

Table 64 continued

Estimates of pre-, intra-, and post-service time from survey and prediction

Specialty	Fill[2]	Service description	Time in minutes			Percentage pre and post of total service time
			Pre-service	Intra-service	Post-service	
Office invasive services						
fp C	4	Rep of 2 inch laceration of scalp, 14yo M, off setting	10.1	21.9	11.4	49
pe P	4	Rep of 2 inch laceration of scalp, 14yo M, off setting	10.1	21.9	11.4	49
ai D	2	Intradermal tsts w allergenic extracts (1st 10)	8.8	20.8	12.1	50
ai G	2	1x inj for immunother, antigen supp by another source	4.4	7.8	3.7	51
dm A	4	Excision changing pigmnted lesion back, 6x4 mm, 52yo M	10.8	21.4	11.7	51
fp F	4	Incision & drainage of peri-anal abscess, off proc	9.8	19.4	10.9	52
fp E	4	Rigid sigmoidoscopy, wo biopsy, in off	9.6	18.7	10.7	52
im D	4	Rigid sigmoidoscopy, wo biopsy, in off	9.6	18.7	10.7	52
dm I	4	Off revisit w est 63yo pt, laser tx hemangioma	9.1	17.3	10.2	53
mx J	2	Excision of 0.5 cm benign lesion of the lip in a 60yo F	10.0	16.3	9.6	55
dm M	4	C&E of 10 by 12 mm (BCE) of cheek of 60yo M	10.3	16.9	10.8	56
pe N	4	Lumbar puncture of 5yo for suspected meningitis	9.1	14.1	9.6	57
ur I	4	Diag cystoscopy, off proc in M w microhematuria	9.6	14.4	10.0	58
pe U	4	Remov of foreign body from ear canal wo gen anesth	7.4	11.4	8.3	58
mx H	2	Extract of abscessed tooth in a healthy 40yo M	7.4	10.0	6.5	58
ai I	2	Fibroscopic exam nasal, choanal, pharynx for nasal polyps	13.9	20.1	14.2	58
dm Q	4	X-ray ther, BCE tip of nose 65yo F, 1x tx, not entire course	7.8	11.5	8.5	59
dm K	4	Photochemother (PUVA), scheduled tx during ther	6.5	9.8	7.5	59
ot U	4	Remov of foreign body from ear canal wo gen anesth	8.2	11.6	8.7	59
im C	3	Aspiration of synovial fluid from knee	9.2	13.0	9.7	59
or R	2	Aspiration of synovial fluid from knee, off proc	9.2	13.0	9.7	59
rh E	3	Aspiration of synovial fluid from knee	9.2	13.0	9.7	59
dm L	4	Shave/punch biopsy probable skin cancer	7.8	11.0	8.4	60
rh G	4	Inj corticosteroid prep into tendon sheath or trigger point	6.8	9.5	7.6	60
or M	2	Closed reduction, subluxation head radius, 4yo M, off setting	6.9	9.5	9.2	63
dm O	4	Liquid nitrogen cryodestruction 3 verrucae hands of 14yo M	6.5	7.8	7.0	63
dm B	4	Cryodest mult, 3 to 4, facial actinic keratoses, 65yo farmer	6.5	7.3	6.9	65
gs I	2	Rigid sigmoidoscopy, wo biopsy, in off	10.2	12.0	11.8	65
pe M	4	Closed reduction, subluxation, head of radius at elbow, 4yo M	6.1	6.6	6.5	66
dm F	4	Intralesional inj, triamcinolone	4.7	3.9	5.0	72

Table 64 continued

Estimates of pre-, intra-, and post-service time from survey and prediction

Specialty	Fill^2	Service description	Time in minutes: Pre-^{3} service	Time in minutes: Scrub wait	Time in minutes: Intra-service	Time in minutes: Post-service	Percentage pre and post of total time
Hospital invasive services							
ob E	5	Normal uncomplicated labor, multipara, no risk, 1x w pt	7.0	0.0	98.5	1.0	7
ob H	5	Protracted labor req pitocin, etc., 1x spent w pt	11.4	0.0	226.0	10.0	9
ob F	5	Labor, moderate hypertension, etc., 1x spent w pt	9.2	0.0	185.3	10.0	9
py P	5	Electroconvulsive ther, 1x seizure, 82yo widowed M hosp, etc.	6.6	0.0	26.3	6.6	33
fp H	5	Uncomplicated spontaneous vaginal delivery	5.0	0.0	57.3	40.8	44
ot Q	4	Acoustic neuroma resection in adlt, translabyrinthine	62.7	22.8	318.8	196.1	47
ot L	2	Parotidectomy, lateral lobe, dissection, etc.	37.4	22.8	156.3	82.5	48
ur A	4	Tot cystectomy and ileal loop, urinary diversion, etc.	68.0	22.8	327.9	213.9	48
ot A	4	Laryngectomy, w radical neck dissection for cancer in 65yo M	58.9	22.8	258.3	176.5	50
pe A	5	Attendance in delivery room w resus of 2000 gram infant	5.0	0.0	34.2	30.3	51
ob G	4	Preterm labor, req tocolysis, etc., 1x spent w pt	32.0	22.8	133.1	83.9	51
an H	6	Insertion of Swan Ganz catheter	14.5	0.0	30.4	18.8	52
gs X	4	Insertion of Swan-Ganz catheter	14.5	0.0	30.4	18.8	52
ob M	5	Uncomplicated spontaneous vaginal delivery	5.0	0.0	40.0	40.8	53
mx A	2	LeFort 1 maxill and sagit split mandib osteotomies, etc.	99.6	22.8	253.3	170.6	54
ts A	2	Redo CABGx3, 1st reop 68yo M, 3 yr post graft, etc.	56.6	22.8	282.3	251.3	54
ot H	4	Tympanoplasty w mastoidectomy for cholesteatoma in adlt	50.4	22.8	175.2	139.9	55
or T	2	Laminectomy, decompression spinal cord, cauda equina, etc.	47.8	22.8	155.1	122.1	55
gs G	2	Low anterior resection for rectal CA	48.4	22.8	151.9	119.0	56
gs A	3	Tot esophagectomy w gastroesophageal anastomosis in chest	57.2	22.8	248.1	253.0	57
ts S	2	Tot esophagectomy w gastroesophageal anastomosis in chest	57.2	22.8	248.1	253.0	57
ot P	4	Cochlear implant, child, bilat sensorineural hearing loss	52.5	22.8	155.7	142.3	58
ts D	2	Primary CABGx3, 65yo M, etc., no complicating assoc disease	53.4	22.8	199.7	217.8	60
ts P	4	Rep ventricular septal defect in 5yo child	58.6	22.8	162.6	160.3	60
ur L	2	Percutaneous nephrostolithotomy, 1 stage, 2 cm stone or less	47.1	22.8	116.5	105.1	60
gs D	2	Modified radical mastectomy	41.8	22.8	102.9	91.1	60
ob V	4	Vaginal hysterectomy, anterior and posterior colporrhaphy	39.4	22.8	106.4	98.9	60
fp G	4	Abdominal hysterectomy, cancer in situ of cervix, 50yo F	33.9	22.8	91.9	82.6	60
ts T	2	Primary aortic valve repl 50yo F, prosth valve, etc.	54.5	22.8	186.3	211.1	61
ot F	4	Septorhinoplasty, primary rhinoplasty septal rep, 25yo M	44.8	22.8	115.4	114.3	61
ts O	2	Carotid endarterectomy, unilat, 58yo F, hx ischemic attacks	42.7	22.8	97.8	91.0	62

Table 64 continued

Estimates of pre-, intra-, and post-service time from survey and prediction

Specialty	Fill^2	Service description	Time in minutes: Pre-^{3} service	Scrub wait	Intra-service	Post-service	Percentage pre and post of total time
Hospital invasive services							
mx Q	2	Open surgical tx, complex mandib fx, etc.	53.8	22.8	129.0	131.8	62
or A	2	Primary tot hip replacement for osteoarthritis	43.8	22.8	127.9	144.6	62
mx T	2	Open tx, mult fx zygomatic arch and malar tripod, etc.	53.4	22.8	123.1	131.0	63
ts I	2	Prosth graft repl 10 cm abd infrarenal aortic aneurysm, etc.	54.2	22.8	166.7	205.8	63
ob J	2	Abdominal hysterectomy, cancer in situ of cervix, 50 yo	35.6	22.8	89.7	96.0	63
mx I	2	Bilat sagitt osteotomy, mandib ramus 20yo F, etc.	91.2	22.8	139.0	130.1	64
ts Q	4	Insertion, mgmt, & remov balloon pump, post CABG, etc.	39.8	22.8	88.5	96.2	64
gs L	2	Abdominal hysterectomy, cancer in situ of cervix, 50yo F	45.0	22.8	84.9	85.5	64
or E	2	Unilat lumbar laminectomy, excision intervertebral disc, etc.	41.9	22.8	85.6	96.0	65
ts H	2	Left upper pulm lobectomy, for squamous bronchogenic ca	49.9	22.8	130.5	186.9	67
op I	4	Lid surg, two-lid blepharoplasty, both upper lids	36.8	22.8	72.8	85.6	67
op A	4	Penetrating keratoplasty, cataract extract and IOL implant	53.9	22.8	101.5	134.3	68
op M	4	Scleral buckle, wo vitrectomy, primary	50.6	22.8	94.3	124.1	68
gs K	2	Cholecystectomy for cholelithiasis	36.3	22.8	64.0	75.0	68
fp D	4	Appendectomy, acute abdomen w unperforated appendicitis	29.0	22.8	52.1	63.1	69
mx D	2	Remov 4 impact (full bony) wisdom teeth, 1x hosp proc, 21yo M	33.7	22.8	49.3	53.2	69
mx P	2	Closed reduction mandib fx by manipulation, etc.	43.5	22.8	64.4	77.6	69
ot O	4	Uvulopalatal pharyngoplasty, upper airway obstruction	36.0	22.8	62.7	81.4	69
gs *	2	Uncomplicated indir inguinal hernia rep, 45yo M	26.3	22.8	41.4	47.1	70
ob I	4	Ovarian cystectomy, unilateral, uncomplicated, in 25 yo	32.2	22.8	53.1	70.3	70
ur N	4	Ureteroscopy w remov of calculus	47.0	22.8	75.3	110.2	70
ur E	4	Insertion non-inflatable, semi-rigid, penile prosth, 60yo M	43.8	22.8	66.0	100.1	72
ts J	2	Mediastinoscopy in pt w suspected paratracheal lymph nodes	34.0	22.8	45.7	59.2	72
ob Q	4	Uncomplicated cesarean delivery, cephalopelvic disproportion	34.6	22.8	51.5	75.0	72
ur H	2	Transurethral resection of prostate, TURP, etc., BPH 70yo M	46.6	22.8	62.2	91.2	72
mx O	2	Unilat Caldwell-Luc proc, etc., w antral polyp remov	35.8	22.8	48.7	69.0	72
ot T	3	Unilat Caldwell-luc proc, maxill sinus disease, polyp remov	35.8	22.8	48.7	69.0	72
ts *	2	Permanent single chamber cardiac pacemaker implantation, etc.	33.0	22.8	46.9	70.4	73
ur T	4	Uncomplicated indirect inguinal hernia repair, 45yo M	38.0	22.8	53.2	83.0	73
or F	2	Open reduction and int fixation, intertrochanteric fx 80yo F	38.7	22.8	73.2	138.4	73

Table 64 continued

Estimates of pre-, intra-, and post-service time from survey and prediction

Specialty	Fill[2]	Service description	Time in minutes Pre-[3] service	Scrub wait	Intra-service	Post-service	Percentage pre and post of total time
Hospital invasive services							
op K	4	Commitant strabismus surg, primary, etc., in a child	39.9	22.8	50.8	86.5	75
gs H	2	Appendectomy, acute abd w unperforated appendicitis	34.6	22.8	36.6	50.3	75
gs F	3	Tonsillectomy and adenoidectomy in 10yo child	25.7	22.8	29.8	42.2	75
ot *	2	Tonsillectomy and adenoidectomy in 10yo child	25.7	22.8	29.8	42.2	75
mx G	2	Extract 10 erupted mandib teeth, 60yo M on Persantine, etc.	37.2	0.0	31.7	59.6	75
ob Y	4	Intracavitary radioelement app, pt w cervical cancer, etc.	26.9	22.8	33.5	53.5	75
ot R	2	Closed reduction nasal fx, stabilization, post trauma 20yo M	24.3	22.8	24.9	30.3	76
ur Q	4	Cystourethroscopy w insertion of indwelling ureteral stent	29.0	22.8	31.5	57.1	78
op J	2	Extracapsular cataract extract w IOL	49.5	22.8	52.7	111.1	78
ts L	2	Thoracentesis, tot evac, effusion and suspected pulm tumor	27.7	22.8	25.8	47.6	79
ur C	4	Fulguration and resection medium bladder tumor, 2-5 cm 65yo M	39.9	22.8	37.2	81.3	79
ur K	4	Cystoscopic laser ther superficial bladder tumor, in hosp	37.3	22.8	34.5	74.9	80
ot G	4	Dir laryngoscopy w biopsy, suspected CA, 50yo M, gen anesth	28.6	22.8	23.7	53.2	82
op E	2	Secondary lens implant, wo vitrectomy	50.3	22.8	38.8	100.0	82
op T	4	Refractive surg, radial keratotomy	39.9	22.8	30.9	78.4	82
ts M	2	Init pericardiocentesis, 35yo M post chest trauma	18.6	22.8	24.3	78.5	83
gs B	2	Chest tube insertion for spontaneous pneumothorax in 20yo	17.9	22.8	15.3	66.9	88
ts B	2	Chest tube insertion for spontaneous pneumothorax, in 20yo	17.9	22.8	15.3	66.9	88
pe K	5	Intubation of newborn	5.0	0.0	4.8	28.8	88

Table 64 continued

Estimates of pre-, intra-, and post-service time from survey and prediction

Specialty	Fill[2]	Service description	Time in minutes: Pre-[3] service	Time in minutes: Scrub wait	Time in minutes: Intra-service	Time in minutes: Post-service	Percentage pre and post of total time
Surgical center invasive services							
or D	2	Arthroscopic partial menisectomy, 22yo M, knee trauma, etc.	26.6	19.0	65.9	19.8	50
mx V	2	Placement of 4 maxill endosseous implants	52.4	19.0	96.2	28.9	51
mx W	2	Unilat meniscoplasty, temporomandibular joint	66.0	19.0	114.5	38.8	52
gs J	2	Colonoscopy and polypectomy, 53yo M, etc., outpt	27.6	19.0	57.0	18.5	53
or C	2	Bunionectomy, Keller/McBride/Mayo type, 45yo F, etc.	27.5	19.0	56.1	20.4	54
or G	2	Reduction unstable closed comminuted fx distal radius, etc.	30.2	19.0	56.2	20.2	55
op U	4	Excision of 0.5 cm basal cell CA, outer 1/3 lower eyelid	32.7	19.0	46.8	25.2	62
ur M	4	Extracorporeal shock wave lithotripsy, etc., 2 cm renal stone	48.7	19.0	66.4	47.2	63
ur U	4	Bilat vasectomy, incl post-op semen examinations	30.1	19.0	41.3	23.4	64
op L	4	Glaucoma filtering proc, primary, trabeculotomy	43.9	19.0	49.5	50.3	70
mx U	2	Unilat arthroscopy of temperomandibular joint	63.3	19.0	50.6	37.7	70
gs M	3	Decompression carpal tunnel, 48yo F, unilat, ambulatory surg	27.8	19.0	27.6	20.1	71
or *	2	Decompression carpal tunnel, 48yo F, unilat, ambulatory surg	27.8	19.0	27.6	20.1	71
ob O	4	Laparoscopic tubal sterilization by fulguration in 35 yo	29.0	19.0	30.5	29.9	72
gs N	4	Excision 0.5 cm basal cell CA, outer 1/3 lower eyelid	24.4	19.0	24.6	24.5	73
ot E	3	Diagnostic fiberoptic bronchoscopy, bronchopulm lesion	30.0	19.0	29.1	43.0	76
ts G	2	Primary diag fiberoptic bronchoscopy, bronchopulm lesion	30.0	19.0	29.1	43.0	76
op *	2	1x chalazion proc, excision, left upper lid	13.5	19.0	13.6	13.7	77
ob S	4	Perf of amniocentesis at 16 weeks gestation	23.3	19.0	20.0	27.6	78
ob W	4	Elective term 1st trimester pregnancy, evac and curettage	25.3	19.0	19.5	34.8	80
ot D	4	Bilateral tympanostomy tube insertion, etc., 2yo, gen anesth	22.1	19.0	13.9	35.8	85
ob *	2	Diagnostic D&C for menometrorrhagia in 50 yo F	22.2	19.0	12.9	41.4	86
ur *	2	Diag cystoscopy hosp, ambulatory surg, M w microhematuria	24.2	19.0	13.3	42.5	87

Table 64 continued

Estimates of pre-, intra-, and post-service time from survey and prediction

Specialty	Fill[2]	Service description	Time in minutes Pre-service	Intra-service	Post-service	Percentage pre and post of total service time
Emergency unit invasive services						
ot M	3	Tracheostomy, emerg proc, transtracheal, adlt, etc.	6.8	24.1	22.3	55
gs E	2	Tracheostomy, emerg proc, transtracheal, in adlt, etc.	6.8	21.8	22.3	57
ts R	2	Tracheostomy, emerg proc, transtracheal, in adlt, etc.	6.8	21.8	22.3	57
Imaging services						
mx R	7	Interp panoramic x-rays remov impacted wisdom teeth, etc.	0.0	7.9	0.0	0
op F	7	Interp formal visual fields tsts, neuro purposes, adlt	0.0	8.9	0.0	0
op G	7	IOL calculation, biometry/keratometry, A-mode	0.0	16.5	0.0	0
op P	7	Interp of fundus photography	0.0	10.0	0.0	0
or L	7	Interp lumbar spine X-rays, complete radiograph exam, etc.	0.0	6.7	0.0	0
or O	7	Interp x-rays, tx comminuted fx distal radius, 3 views, etc.	0.0	7.6	0.0	0
or P	7	Interp elbow x-rays: complete radiograph exam, for pain, etc.	0.0	4.8	0.0	0
or Q	7	Interp foot x-rays, poss fx, complete radiograph exam, etc.	0.0	5.1	0.0	0
or U	7	Interp hip x-rays, complete, for moderate/severe hip pain	0.0	5.4	0.0	0
rh B	7	Interp x-rays, hands, bilateral, acute rheumatoid arthritis	0.0	5.2	0.0	0
rh L	7	Interp bone density study, dual photon absorptiometry, etc.	0.0	6.3	0.0	0
rh Q	7	Interp of hip x-rays, complete, for moderate/severe hip pain	0.0	4.5	0.0	0
mx S	7	Perf and interp bilat Xray TMJ, open and closed, etc.	0.0	22.4	0.0	0
ob R	7	Fetal ultrasound poss fetal abnorm, B-scan w image doc	0.0	33.4	0.0	0
op H	7	Diagnostic ultrasonography eye ball w interp, B-Mode, etc.	0.0	20.3	0.0	0
ra M	4	IV urography, pyelography incl kidneys, ureters, etc.	4.5	22.6	8.7	37
ra *	2	Upper GI series, air contrast technique, KUB abd pain, etc.	4.8	17.1	5.9	38
ra N	2	Venography, unilat, complete proc, poss vein thrombosis, etc.	8.6	27.7	8.6	38
ra F	5	Interp computerized axial tomography, abd, etc., cancer	4.5	15.3	5.0	38
ra D	4	Barium enema, double contrast, complete proc, occult GI, etc.	5.2	23.6	10.4	40
ra R	4	Hysterosalpingography, complete proc, 26yo F w infertility	5.2	23.6	10.4	40
or S	5	Perf and interp a lumbar myelogram, 68yo F	9.3	41.3	19.0	41
ra S	4	Perf & interp a lumbar myelogram, 68yo F	9.3	41.3	19.0	41
ra H	4	Computerized tomography guidance needle biopsy, etc.	10.6	46.8	21.9	41

Table 64 continued

Estimates of pre-, intra-, and post-service time from survey and prediction

Specialty	Fill[2]	Service description	Time in minutes Pre-service	 Intra-service	 Post-service	Percentage pre and post of total service time
Imaging services						
ra E	4	Complete abd echography, B-scan, image doc, complete, etc.	5.5	23.5	11.1	41
ra K	4	MRI spinal cord, incl spine, unexplained motor weakness, etc.	8.1	34.9	16.8	42
ra A	4	Cervicocerebral angiography, selective catheter, etc.	21.2	92.4	45.2	42
ra G	4	Echography pregnant uterus, B-scan image doc, complete, etc.	5.7	22.6	11.9	44
ra C	4	Interp bilat rib x-rays, incl posteroanterior chest, etc.	1.4	5.3	2.8	44
ra T	4	Interp of hip x-rays, complete, for moderate/severe hip pain	1.2	4.5	2.3	44
ra P	4	Interp bone density study, dual photon absorbtiometry, etc.	1.7	6.3	3.4	44
ra I	4	Interp rad exam ankle, complete, min 3 views, etc., fx	0.9	3.1	1.7	45
ra L	4	Interp complete abd incl decubitus, etc., intest obstruction	1.4	5.1	2.8	45
ra Q	2	Interp lumbar spine x-rays, complete radiograph exam, etc.	1.7	5.4	2.7	45
ra O	4	Interp of complete skull series for headaches in an adlt	1.3	4.7	2.6	45
ra B	4	Interp chest x-rays, 2 views, frontal & lateral, etc.	1.0	3.4	2.0	47
ra J	4	Interp mammography, bilat, for 50yo pt w pain in breasts	2.4	8.1	4.9	47

Table 64 continued

Estimates of pre-, intra-, and post-service time from survey and prediction

Specialty	Fill[2]	Service description	Time in minutes Pre-service	Time in minutes Intra-service	Time in minutes Post-service	Percentage pre and post of total service time
Anesthesia services						
an A	6	Anesth for CABG w pump oxygenator	34.4	260.6	78.7	30
an T	6	Anesth for craniectomy or craniotomy	32.9	237.1	72.6	31
an D	6	Anesth for femoral-popliteal bypass	29.8	192.6	60.2	32
an G	6	Anesth for total hip replmnt	29.0	181.6	57.4	32
an C	2	Anesth for colectomy	26.4	146.4	43.7	32
mx M	2	Gen anesth, off extract 4 wisdom teeth healthy 18yo M, etc.	12.0	44.0	10.1	33
an P	6	Anesth for carotid endarterectomy	24.9	132.1	43.5	34
an S	6	Anesth for modified radical mastectomy	24.1	121.7	40.8	35
an J	6	Anesth for open reduction and int fixation hip fx	23.5	116.3	39.0	35
an K	2	Anesth for rep of AAA	36.4	241.1	93.9	35
an F	6	Anesth for cholecystectomy	21.8	99.1	34.0	36
an U	6	Anesth for cesarean section	19.9	81.0	29.0	38
an O	6	Anesth for transurethral resection of prostate	20.2	82.2	29.7	38
an I	6	Anesth for knee arthroscopy	19.6	78.0	28.1	38
an M	6	Anesth for lens surgery, cataract extraction, etc	19.3	74.6	27.4	39
an Q	6	Regional IV anesth for upper extremity op	17.5	61.2	23.2	40
an *	2	Anesth for inguinal hernia rep	18.1	64.8	26.4	41
an E	6	Anesth for laparoscopic tubal ligation	15.3	45.6	18.2	42
an R	6	Inj of anesthetic substance, therapeutic, 1x, epidural block	13.6	35.3	14.8	45
an B	6	Anesth for cystoscopy	12.5	29.3	12.9	46
an L	6	Anesth for D&C of uterus	11.7	25.6	11.6	48
mx E	5	Gen anesth 14yo child, expos 1 impacted cuspid, off setting	11.8	29.2	18.1	51
mx N	5	Gen anesth for extract of fx tooth in 4yo child	8.0	15.3	12.4	57
mx F	2	Gen anesth extract abscessed tooth in healthy 40yo M	10.7	13.2	8.1	59
gs C	5	Regional IV anesth, upper extremity op, surg by other	17.5	17.1	23.2	70

Table 64 continued

Estimates of pre-, intra-, and post-service time from survey and prediction

Specialty	Fill[2]	Service description	Time in minutes Pre-service	 Intra-service	 Post-service	Percentage pre and post of total service time
Laboratory services						
ai H	7	Interp of pulm function tsts, interp results, FVC, FEV, FEF	0.0	8.8	0.0	0
ai Q	7	Interp of serum immunoelectrophoresis	0.0	7.3	0.0	0
fp I	7	Urinalysis w micro exam, off lab, supervs, excl collection	0.0	5.0	0.0	0
im E	7	Urinalysis w micro exam, off lab, supervs, excl collection	0.0	6.2	0.0	0
ob T	7	Interp of fetal non stress tst	0.0	6.5	0.0	0
op R	7	Endothelial cell count pre-op cataract surg	0.0	13.0	0.0	0
ot J	7	Interp of audiometry, basic, comp	0.0	6.9	0.0	0
ot K	7	Interp of spontaneous nystagmus tst, w recording (ENG)	0.0	13.4	0.0	0
pe Q	7	Urinalysis w micro exam, off lab, excl collection	0.0	6.2	0.0	0
rh P	7	Interp of sed rate, (ESR) Westergren type	0.0	2.9	0.0	0
rh R	7	Interp of platelet count, Coulter counter	0.0	2.5	0.0	0
dm D	7	Obtain specimen Tzanck Smear and interp of tst	0.0	10.0	0.0	0
dm H	7	Obtain specimen for KOH slide and interp of tst	0.0	7.6	0.0	0
fp J	7	Obtain specimen for KOH slide and interp of tst	0.0	7.6	0.0	0
im U	7	ECG w interp in a 50yo M	0.0	7.6	0.0	0
rh F	7	Perf & interp cell count, differential, etc., synovial fluid	0.0	14.5	0.0	0
ur R	7	Semen analysis for infertility	0.0	15.7	0.0	0
dm S	7	Path gross and micro exam, melanocytic lesion, 26yo F	0.0	12.8	0.0	0

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[1] Pre- and post-service times are reported for the 407 surveyed services which represent the 372 distinct services in our study. The "same services" are identified by identical wording of the vignette and equal amounts of time.

[2] The "Fill" column represents the method used to estimate pre- and post-service time: the code to the column entries is: 2= obtained from survey, 3= set to the surveyed time of a "same service", 4= predicted using regression, 5= predictions modified based on clinical judgement, 6= anesthesia services by anesthesiologists, predicted using within specialty regression, 7= pre- and post-service time not defined.

[3] The pre-service time for hospital and surgical center invasive services does not include the scrub and wait time of the physician which is reported as a separate value. The total pre-service time for these services is equal to the sum of the columns "pre-service" and "scrub and wait" time.

Table 65

Standard errors of mean physician responses for service times

Service class	Mean standard error as a percentage of service time[1]		
	Pre-service time	Intra-service time	Post-service time
Evaluation and management (all settings)	12.3	6.0	10.6
Imaging	7.7	5.4	8.6
Anesthesia	3.7	5.8	5.5
Invasive, office setting	11.2	12.9	10.5
Invasive, surgical center setting	7.9	5.5	8.8
Invasive, hospital inpatient setting	7.1	5.0	8.7

[1] For comparison purposes, the sample size used in the calculation of the standard error of the mean was adjusted to reflect the sample size used in obtaining intra-service time data. The standard error is the approximate standard error as a percentage of the mean survey time (see section 5.2.3 for details).

Table 66

Services for which pre- and/or post-service time were modified based on clinical judgment following consultation with TCG panelists

Specialty	Service	Service description
fp	X	Phone consult, pt home, 1:30 A.M., belching, etc.
gs	C	Regional IV anesth, upper extremity op, surg by other
im	V	Off phone consult re: poss adverse drug react in est pt
im	W	Phone consult pt home, 1:30 A.M., belching, etc.
mx	E	Gen anesth 14yo child, expos 1 impacted cuspid, off setting
mx	N	Gen anesth for extract of fx tooth in 4yo child
pe	J	2:00 A.M. phone call for crying child under 12 months
pe	T	Phone call during off hours for child w rash on Amoxicillin
ra	F	Interp computerized axial tomography, abd, etc., cancer

Table 67

Comparison of RBRVS estimated total time per office visit with estimates from other sources

	Total time per office-visit service (in minutes)		
Specialty	RBRVS[1]	American Medical Association[2]	Mendenhall[3]
Family practice	22.7	21.0	19.3
Internal medicine	22.1	25.7	26.9
Obstetrics and gynecology	25.9	21.0	20.6
General surgery	23.0	22.5	16.0

[1] Total time includes pre-, intra-, and post-service time for an office visit. The value is the mean of the mean intermediate and mean limited office-visit time estimates. The number of surveyed services available for inclusion in the RBRVS estimates were 6, 4, 4, and 2 for Family Practice, Internal Medicine, Obstetrics and Gynecology, and General Surgery, respectively.

[2] Total time per office visit, derived from median total office hours per week and median total office visits per week. The value for Internal Medicine is for general internal medicine.

[3] Total time per office visit, derived from mean total time for office exams and treatments and mean total office visits.

Table 68

Results of the clustering of work per minute (W/T) for evaluation and management services, four levels[1]

Level of W/T	Number of services	Mean work per minute	Standard error as a percentage of mean	Range of work per minute
Level 1	12	2.16	3.2	0.78
Level 2	60	2.80	0.8	0.61
Level 3	63	3.44	0.9	0.97
Level 4	10	4.85	4.0	1.94

[1] The mean, standard error, and range are reported on the untransformed scale and are based on the antilogarithms of the cluster results.

Table 69

Results of statistical cluster analysis of intra-service work, by broad service class and statistically assigned levels of work per unit time (W/T)

Specialty	Service description		Mean[1] intra-service work	Statistically assigned level of W/T
Non-invasive services				
ra	I	Interp rad exam ankle, complete, min 3 views, etc., fx	14	1
pe	B	Off eval of diaper dermatitis, est pt	16	1
pe	T	Phone call during off hours for child w rash on Amoxicillin	17	1
ra	B	Interp chest x-rays, 2 views, frontal & lateral, etc.	18	1
ra	T	Interp of hip x-rays, complete, for moderate/severe hip pain	21	1
rh	Q	Interp of hip x-rays, complete, for moderate/severe hip pain	21	1
rh	B	Interp x-rays, hands, bilateral, acute rheumatoid arthritis	21	1
ra	O	Interp of complete skull series for headaches in an adlt	24	1
ra	C	Interp bilat rib x-rays, incl posteroanterior chest, etc.	24	1
ra	L	Interp complete abd incl decubitus, etc., intest obstruction	26	1
mx	R	Interp panoramic x-rays remov impacted wisdom teeth, etc.	26	1
mx	B	Ov to advise remov wisdom teeth, 18yo M, etc.	26	1
ra	Q	Interp lumbar spine x-rays, complete radiograph exam, etc.	27	1
dm	G	Off revisit for eval of 28yo M w onychomycosis	27	1
fp	B	Off revisit for eval of 28yo M w onychomycosis	27	1
im	V	Off phone consult re: poss adverse drug react in est pt	28	1
or	P	Interp elbow x-rays: complete radiograph exam, for pain, etc.	29	1
dm	*	Foll-up visit w 48yo M ongoing mgmt psoriasis not PUVA tx	29	1
pe	*	Ov, est pt, 6yo child w sore throat and headache	29	1
ra	P	Interp bone density study, dual photon absorbtiometry, etc.	30	1
rh	L	Interp bone density study, dual photon absorptiometry, etc.	30	1
or	Q	Interp foot x-rays, poss fx, complete radiograph exam, etc.	30	1
op	S	Off eval poss purulent conjunctivitis 16yo F, est pt	31	1
pe	J	2:00 A.M. phone call for crying child under 12 months	31	1
fp	M	Off eval, poss purulent conjunctivitis 16yo F, est pt	32	1
im	H	Off eval, poss purulent conjunctivitis 16yo F, est pt	32	1
pe	R	Off eval, poss purulent conjunctivitis 16yo F, est pt	32	1
or	U	Interp hip x-rays, complete, for moderate/severe hip pain	34	1
ur	B	Foll-up hosp visit 2 days post uncomplicated TURP in 70yo M	35	1

Table 69 continued

Results of statistical cluster analysis of intra-service work, by broad service class and statistically assigned levels of work per unit time (W/T)

Specialty	Service description		Mean[1] intra-service work	Statistically assigned level of W/T
gs	U	Hosp visit, 3 days post uncomplicated cholecystectomy, etc.	35	1
ts	C	Foll-up hosp visit, day 1 post-op chest tube insertion, etc.	36	1
or	L	Interp lumbar spine X-rays, complete radiograph exam, etc.	36	1
op	B	Foll-up exam, est pt, incl visual acuity, slit lamp, etc.	36	1
op	P	Interp of fundus photography	37	1
gs	Q	Foll-up ov, 60yo est pt 8 weeks post partial colectomy, etc.	37	1
im	B	Ov, sore throat, fever, fatigue 19yo college student, est pt	37	1
ot	B	Ov, sore throat, fever, fatigue, 19yo college student, est pt	37	1
ob	B	Limited prenatal foll-up visit, hx and exam, etc.	38	1
fp	L	Ov, est pt, 6yo child w sore throat and headache	39	1
ai	*	Foll-up ov for pharmacological mgmt of 30yo F w hay fever	40	1
op	F	Interp formal visual fields tsts, neuro purposes, adlt	41	1
or	O	Interp x-rays, tx comminuted fx distal radius, 3 views, etc.	42	1
fp	Y	1x supervs conf w nurse, antibiotic ther, est pt w SBE	43	1
im	X	1x supervs conf w nurse, antibiotic ther, est pt w SBE	43	1
fp	*	Foll-up visit 55yo M, mgmt hypertension, beta/thiazide	44	1
im	*	Foll-up visit 55yo M, mgmt hypertension, beta/thiazide	44	1
gs	R	Foll-up visit, post tx, pt w primary breast cancer	44	1
ai	B	OV, est pt, 6yo child w sore throat and headache	47	1
rh	*	Foll-up ov, etc., Stage II, Class II, rheumatoid arthritis	47	1
or	B	Day 3 or 4 post-op foll-up, 80yo F, rep intertrochanteric fx	48	1
rh	N	Ltd ov, est pt known osteoarthritis and painful swollen knees	49	1
fp	X	Phone consult, pt home, 1:30 A.M., belching, etc.	49	1
fp	R	Sched monthly NH visit to est pt w Organic Brain Syndrome	50	1
im	P	Sched monthly NH visit to est pt w Organic Brain Syndrome	50	1
ob	P	Ov postpartum care 6 weeks, uncomplicated vaginal delivery	50	1
fp	W	Comp well child visit at 6 months, est pt (AAP guidelines)	50	1
pe	C	Comp well child visit at 6 months, est pt (AAP Guidelines)	50	1
ra	J	Interp mammography, bilat, for 50yo pt w pain in breasts	50	1
mx	L	Ov 45yo F smoker w small oral ulcer on lateral border tongue	50	1
or	K	Intermed ov, est pt known osteoarthritis and swollen knees	54	2

Table 69 continued

Results of statistical cluster analysis of intra-service work, by broad service class and statistically assigned levels of work per unit time (W/T)

Specialty	Service description		Mean^1 intra-service work	Statistically assigned level of W/T
pe	D	Comp well child visit at 2 years, est pt (AAP Guidelines)	54	2
py	B	Phone conv, retarded mother of 18yo schizophrenic M, etc.	56	2
fp	O	Ov 45yo M, est pt, chronic asthma, on chronic steroid, etc.	57	2
im	I	Ov 45yo M, est pt, chronic asthma, on chronic steroid, etc.	57	2
py	F	Repeat hosp visit stabilized 42yo M, schizophrenia, etc.	58	2
dm	E	Init ov, 35yo M w complaint of alopecia	59	2
fp	N	Routine gyn exam, 24yo est pt, wo complaints	59	2
ob	K	Routine gyn exam, primary care phys, est pt, wo complaints	59	2
ra	*	Upper GI series, air contrast technique, KUB abd pain, etc.	59	2
im	N	Foll-up hosp visit, day 2, pt non-dominant CVA, etc.	60	2
op	C	Comp eye exam, adlt pt w no specific complaints, hx, etc.	61	2
dm	J	Init ov, 16yo M w severe cystic acne, new pt	62	2
dm	C	Init ov, eval and counseling 17yo F w primary genital herpes	66	2
im	W	Phone consult pt home, 1:30 A.M., belching, etc.	66	2
pe	E	Comp well child visit at 5 years, new pt (AAP Guidelines)	68	2
or	N	1st visit eval and counseling 28yo M runner, knee/calf pain	69	2
op	G	IOL calculation, biometry/keratometry, A-mode	70	2
pe	I	Off eval head trauma, pre-school child w vomiting, est pt	70	2
im	O	Hosp visit, day 3 post adm, 65yo M uncomplicated MI, est pt	70	2
rh	I	Foll-up visit 45yo, rheumatoid arthritis on gold, etc.	72	2
ot	C	Init off eval gradual hearing loss, 58yo M, hx, etc.	72	2
im	T	Init off eval of a 37 generally well M	72	2
ai	K	Prof svcs for supervs and prov antigens, allergen immunother	72	2
py	O	Ov chemother for mgmt of 44yo M w bipolar depression	73	2
ob	D	Ext foll-up prenatal visit at 36-37 weeks, etc.	73	2
pa	N	Consult for transfusion react in pt w fever and back pain	74	2
mx	S	Perf and interp bilat Xray TMJ, open and closed, etc.	74	2
dm	R	Init off eval, adlt w chronic recurrent hives, new pt	75	2
rh	M	Foll up off consult, 45yo M ankylosing spondylitis, etc.	76	2
pe	S	Init ov for eval of child w chronic wheezing	76	2
ot	N	Eval hoarseness and dysphagia, 65yo M incl hx and physical	77	2
ts	E	Hosp visit, day 2 post-op, CABGx3, 65yo M, no assoc disease	77	2

Table 69 continued

Results of statistical cluster analysis of intra-service work, by broad service class and statistically assigned levels of work per unit time (W/T)

Specialty	Service description		Mean[1] intra-service work	Statistically assigned level of W/T
pe	F	Comp well child visit at 15 years, new pt (AAP Guidelines)	78	2
ur	D	Off eval new onset right lower quad pain 32yo F, est pt	80	2
im	S	Init eval and mgmt of recurrent urinary tract inf in F	80	2
ur	O	Init eval and mgmt of recurrent urinary tract inf in F	80	2
ai	O	OV 45yo M, est pt, chronic asthma, on chronic steroid, etc	86	2
pe	O	Foll-up visit, adolescent w behavior problem, etc., est pt	86	2
dm	T	Init comp eval 30yo F w symptoms of SCLE	87	2
pa	K	Consult in an intrapartum bleeding diathesis	88	2
fp	Q	Off eval 28yo pt regional enteritis, diarrhea, est pt	88	2
im	L	Off eval 28yo pt regional enteritis, diarrhea, est pt	88	2
ur	G	Init off eval diagnosis & mgmt painless gross hematuria, etc.	89	2
ob	U	Init ov eval and counseling 17 yo F w primary genital herpes	89	2
ra	D	Barium enema, double contrast, complete proc, occult GI, etc.	90	2
ra	R	Hysterosalpingography, complete proc, 26yo F w infertility	91	2
pe	H	Init visit of adolescent F w abd pain, new pt	91	2
fp	P	Off eval new onset right lower quad pain in 32yo F, est pt	92	2
gs	S	Off eval new onset right lower quad pain in 32yo F, est pt	92	2
im	J	Off eval new onset right lower quad pain in 32yo F, est pt	92	2
ob	L	Off eval new onset right lower quad pain in 32 yo F, est pt	92	2
ot	S	Rhinoplasty eval, 25yo F, incl hx, physical, etc.	93	2
op	H	Diagnostic ultrasonography eye ball w interp, B-Mode, etc.	97	2
ot	I	Eval recurrent dizziness and vertigo 48yo F, incl hx, etc.	97	2
dm	P	Hosp consult, poss drug eruption, 50yo M	98	2
rh	J	Foll-up visit 40yo mother, Stage III, Class III, etc.	99	2
gs	P	Comp ov, init eval 48yo M recurrent low back pain to leg	99	2
or	I	Comp ov, init eval 48yo man recurrent low back pain to leg	99	2
im	F	Init off eval, diagnosis and mgmt hematuria, etc.	99	2
py	H	Weekly med psychother and pharmacother ov, 36yo F, etc.	100	2
ra	E	Complete abd echography, B-scan, image doc, complete, etc.	100	2
fp	S	NH visit, unsched, eval pt w fever and obtundation, etc.	100	2

Table 69 continued

Results of statistical cluster analysis of intra-service work, by broad service class and statistically assigned levels of work per unit time (W/T)

Specialty	Service description		Mean[1] intra-service work	Statistically assigned level of W/T
py	C	Foll-up psychother ov, 48yo housewife for tx of agoraphobia	102	2
or	H	Comp init off visit for eval 13yo F w progressive scoliosis	103	2
py	*	2nd ov after referral from internist, 25yo M panic attacks	103	2
ai	P	Med conf w pt. and/or family, counseling for avoidance, etc	104	2
ur	F	Init consult for infertility in 35yo M	106	2
ra	F	Interp computerized axial tomography, abd, etc., cancer	107	2
gs	T	Hosp adm, 45yo F w acute cholecystitis	107	2
op	D	Consult/ext eval complex ophthalmic problem, etc.	108	2
ob	Z	Ov counseling 25yo primigravida, family hx of Downs Syndrome	109	2
an	V	Consult for transfusion react in pt w fever and back pain	111	2
ob	A	Init off eval secondary amenorrhea, 22 yo new pt, etc.	112	2
ur	J	Init eval and mgmt of recurrent renal calculi in 40yo M	112	2
pe	L	Poss of sexual abuse in 5yo F, new pt	113	2
ts	N	Init off eval 50yo M w aortic aneurysm, to recommend surg	113	2
py	G	Ov, term 66yo business executive 2x weekly psychother, etc.	114	2
op	O	Contact lens eval and fitting, incl comp eye exam, etc.	116	2
ra	G	Echography pregnant uterus, B-scan image doc, complete, etc.	117	2
im	Q	NH visit, unsched, for eval pt w fever and obtundation, etc.	118	2
ts	F	Init hosp eval pulm tumor 45yo smoker, prev in good health	122	2
fp	K	Init visit pregnancy 25yo primigravida, hx and exam, etc.	122	2
ob	C	Init visit pregnancy 25 yo primigravida, hx and exam, etc.	122	2
gs	O	Preoperative eval new pt w primary hyperparathyroidism	124	3
py	U	Ov individ psychoanalysis 42yo, passive-aggressive, etc.	125	3
pe	G	Hosp adm for 18 month old child w 10% dehydration	126	3
im	K	Ov eval recent onset syncopal attacks, 70yo F, est pt	126	3
ts	U	Eval 65yo M,chronic stable angina and coronary artery disease	127	3
ts	K	Ext init off eval of 70yo F w increasing dysphagia	131	3
fp	U	Off consult psych exam 25yo M, intellect deterioration, etc.	132	3
mx	K	Comp eval 28yo F, 2 year hx facial/TMJ pain, etc.	134	3
py	E	Eval records and reports, 69yo F, pre-syncopal episodes, etc.	135	3
py	X	Prep report to DMH halfway house coord, 3-week hosp, etc.	135	3

Table 69 continued

Results of statistical cluster analysis of intra-service work, by broad service class and statistically assigned levels of work per unit time (W/T)

Specialty / Service / Vignette			Mean[1] intra-service work	Statistically assigned level of W/T
ur	S	Init eval and mgmt of unexplained renal failure in a 40yo F	141	3
py	S	Ov diag reeval 68yo F, chronic depression, unresponsive tx	144	3
im	R	Hosp consult for diagnosis/mgmt of fever foll abdominal surg	146	3
ob	X	Init ov 34 year pt w primary infertility, incl counseling	146	3
py	I	Family psychother, husband of 28yo F, bipolar illness, etc.	149	3
rh	H	Init off eval pt, negative lab and x-ray studies, fibrositis	149	3
fp	A	Dir hosp adm yng adlt est pt, acute asthma attack	151	3
ai	F	Init ov for eval of child w chronic wheezing	152	3
ob	R	Fetal ultrasound poss fetal abnorm, B-scan w image doc	152	3
py	R	1x supervisory conf, team RNs, SWs, andn MHWs, psych unit	152	3
rh	O	Comp init eval 48yo M recurrent back pain radiating to leg	153	3
im	M	Dir hosp adm of 62yo smoker, est pt, respiratory distress	154	3
ai	N	Init off eval of adlt w chronic recurrent hives, new pt	158	3
ra	K	MRI spinal cord, incl spine, unexplained motor weakness, etc.	159	3
fp	V	Emerg hosp consult, 72yo, new pt, w poss bowel obstruction	159	3
gs	W	Emerg hosp consult, 72yo, new pt, poss bowel obstruction	159	3
py	K	Group med psychother in-off, 6 pts seen weekly, etc.	160	3
ai	L	Eval of 6yo M w mult infs, new pt	162	3
rh	C	Init off eval of 70yo F w polyarthralgia	163	3
an	N	Eval 63yo pt, ICU w diabetes and chronic renal failure, etc	167	3
py	D	Hosp consult, psych eval 68yo surg, post-op depression	172	3
fp	T	Mgmt pt acute pulm edema in ER, subsequent hosp adm, est pt	174	3
or	S	Perf and interp a lumbar myelogram, 68yo F	177	3
ra	S	Perf & interp a lumbar myelogram, 68yo F	177	3
py	W	Eval & level care decision 17yo adolescent, schizo, etc.	178	3
py	N	Off consult psych eval 65yo M, intellect deterioration, etc.	181	3
py	M	Ov diag interview & eval 17yo M, personality change, etc.	183	3
im	G	Emerg hosp consult, 72yo, new pt, w poss bowel obstruction	187	3
py	J	Mult family group med psychother of families, in-pts, etc.	191	3
py	T	Ov family psychother, 38yo father incestuous w 12yo daughter	197	3
py	L	Hosp ER eval 78yo F, ingested alcohol and valium, suicide	197	3

Table 69 continued

Results of statistical cluster analysis of intra-service work, by broad service class and statistically assigned levels of work per unit time (W/T)

Specialty		Service description	Mean[1] intra-service work	Statistically assigned level of W/T
ai	E	Dir hosp adm, yng adlt pt, failed prev ther, asthmtic attack	199	3
ai	R	Dir hosp adm of 62yo smoker, est pt, respiratory distress	205	3
ra	H	Computerized tomography guidance needle biopsy, etc.	208	3
rh	D	Consult hosp, 35yo F, fever, swelling joints, rash, etc.	211	3
im	A	Mgmt pt acute pulm edema in ER, subsequently adm hosp, est pt	230	3
rh	K	Init off eval & mgmt pt, vasculitis and circulation	250	3
rh	A	Init off eval SLE, fever, seizures and thrombocytopenia	263	3
gs	V	Init eval mgmt mult trauma pt w complex pelvic fx, 35yo M	279	3
py	V	Court-requested eval juvenile, attempted rape a 71yo F, etc.	283	3
or	J	Init eval, mgmt mult trauma pt, complex pelvic fx, 35yo M	290	3
py	A	ER eval, intervention 25yo M, voices, attempt stab, etc.	300	3
gs	Y	Triage, resus and hosp adm from ER, 52yo, alcoholic, etc.	340	3
py	Q	Eval 24yo M, murder, competency to stand trial, etc.	378	3
Office, surgical center, and emergency unit invasive and anesthesia services[2]				
ai	G	1x inj for immunother, antigen supp by another source	19	1
dm	F	Intralesional inj, triamcinolone	24	1
dm	K	Photochemother (PUVA), scheduled tx during ther	32	1
pe	M	Closed reduction, subluxation, head of radius at elbow, 4yo M	37	1
rh	G	Inj corticosteroid prep into tendon sheath or trigger point	39	1
dm	O	Liquid nitrogen cryodestruction 3 verrucae hands of 14yo M	40	1
dm	B	Cryodest mult, 3 to 4, facial actinic keratoses, 65yo farmer	41	1
pe	U	Remov of foreign body from ear canal wo gen anesth	45	1
op	*	1x chalazion proc, excision, left upper lid	48	1
mx	H	Extract of abscessed tooth in a healthy 40yo M	51	1
im	C	Aspiration of synovial fluid from knee	52	1
or	R	Aspiration of synovial fluid from knee, off proc	52	1
rh	E	Aspiration of synovial fluid from knee	52	1
dm	Q	X-ray ther, BCE tip of nose 65yo F, 1x tx, not entire course	53	1
dm	L	Shave/punch biopsy probable skin cancer	58	1

Table 69 continued

Results of statistical cluster analysis of intra-service work, by broad service class and statistically assigned levels of work per unit time (W/T)

Specialty	Service description		Mean[1] intra-service work	Statistically assigned level of W/T
gs	I	Rigid sigmoidoscopy, wo biopsy, in off	61	1
ai	M	A&R of intradermal tsts w antigens, immune deficiency eval	63	1
ot	U	Remov of foreign body from ear canal wo gen anesth	64	1
dm	I	Off revisit w est 63yo pt, laser tx hemangioma	65	1
an	L	Anesth for D&C of uterus	65	1
ra	M	IV urography, pyelography incl kidneys, ureters, etc.	68	1
mx	J	Excision of 0.5 cm benign lesion of the lip in a 60yo F	73	1
or	M	Closed reduction, subluxation head radius, 4yo M, off setting	73	1
an	B	Anesth for cystoscopy	73	1
fp	E	Rigid sigmoidoscopy, wo biopsy, in off	74	1
im	D	Rigid sigmoidoscopy, wo biopsy, in off	74	1
fp	C	Rep of 2 inch laceration of scalp, 14yo M, off setting	75	1
pe	P	Rep of 2 inch laceration of scalp, 14yo M, off setting	75	1
ai	D	Intradermal tsts w allergenic extracts (1st 10)	76	1
fp	F	Incision & drainage of peri-anal abscess, off proc	77	1
ai	C	Percutaneous tsts w allergenic extracts (1st 30)	77	1
pe	N	Lumbar puncture of 5yo for suspected meningitis	78	1
gs	C	Regional IV anesth, upper extremity op, surg by other	79	1
mx	*	Expos 1x impact cuspid, off, 14yo future ortho tx, etc.	89	2
ur	*	Diag cystoscopy hosp, ambulatory surg, M w microhematuria	92	2
mx	F	Gen anesth extract abscessed tooth in healthy 40yo M	93	2
ur	I	Diag cystoscopy, off proc in M w microhematuria	95	2
an	*	Anesth for inguinal hernia rep	96	2
ai	I	Fibroscopic exam nasal, choanal, pharynx for nasal polyps	100	2
op	Q	Fluorescein angiography diabetic retinopathy, etc., interp	101	2
ob	*	Diagnostic D&C for menometrorrhagia in 50 yo F	101	2
dm	A	Excision changing pigmnted lesion back, 6x4 mm, 52yo M	101	2
an	Q	Regional IV anesth for upper extremity op	101	2
ot	D	Bilateral tympanostomy tube insertion, etc., 2yo, gen anesth	104	2
an	I	Anesth for knee arthroscopy	105	2
dm	U	Excision of 2 facial nevi, 20yo M, 8 and 4 mms respectively	105	2

Table 69 continued

Results of statistical cluster analysis of intra-service work, by broad service class and statistically assigned levels of work per unit time (W/T)

Specialty	Service description		Mean[1] intra-service work	Statistically assigned level of W/T
ra	N	Venography, unilat, complete proc, poss vein thrombosis, etc.	107	2
dm	M	C&E of 10 by 12 mm (BCE) of cheek of 60yo M	108	2
ur	P	Cystometrogram calibrated electronic equipment, etc.	115	2
ob	N	Colposcopy abnorm cervical cytology, Pap smear, w biopsy	120	2
ob	S	Perf of amniocentesis at 16 weeks gestation	124	2
mx	E	Gen anesth 14yo child, expos 1 impacted cuspid, off setting	125	2
an	R	Inj of anesthetic substance, therapeutic, 1x, epidural block	126	2
an	E	Anesth for laparoscopic tubal ligation	127	2
mx	N	Gen anesth for extract of fx tooth in 4yo child	130	2
gs	N	Excision 0.5 cm basal cell CA, outer 1/3 lower eyelid	141	2
an	M	Anesth for lens surgery, cataract extraction, etc	147	2
mx	M	Gen anesth, off extract 4 wisdom teeth healthy 18yo M, etc.	147	2
ai	A	Intracut, intradermal, tsts insects, immed react, 11-15 tsts	151	2
ob	W	Elective term 1st trimester pregnancy, evac and curettage	152	2
dm	N	Excision & intermed rep of 4 by 6 mm BCE of forehead 30yo F	155	2
ai	J	Inhalation bronchial challenge tstg w histamine, etc	156	2
an	O	Anesth for transurethral resection of prostate	173	2
an	S	Anesth for modified radical mastectomy	176	2
gs	M	Decompression carpal tunnel, 48yo F, unilat, ambulatory surg	193	2
or	*	Decompression carpal tunnel, 48yo F, unilat, ambulatory surg	193	2
ot	E	Diagnostic fiberoptic bronchoscopy, bronchopulm lesion	199	2
ts	G	Primary diag fiberoptic bronchoscopy, bronchopulm lesion	199	2
an	F	Anesth for cholecystectomy	201	2
ob	O	Laparoscopic tubal sterilization by fulguration in 35 yo	224	2
an	U	Anesth for cesarean section	231	3
an	J	Anesth for open reduction and int fixation hip fx	232	3
ur	U	Bilat vasectomy, incl post-op semen examinations	253	3
an	C	Anesth for colectomy	256	3
mx	C	Remov 4 impact (full bony) wisdom teeth, 1x off proc, 21yo M	287	3
gs	E	Tracheostomy, emerg proc, transtracheal, in adlt, etc.	288	3
ts	R	Tracheostomy, emerg proc, transtracheal, in adlt, etc.	288	3

Table 69 continued

Results of statistical cluster analysis of intra-service work, by broad service class and statistically assigned levels of work per unit time (W/T)

Specialty		Service description	Mean[1] intra-service work	Statistically assigned level of W/T
an	G	Anesth for total hip replmnt	292	3
an	D	Anesth for femoral-popliteal bypass	299	3
op	U	Excision of 0.5 cm basal cell CA, outer 1/3 lower eyelid	317	3
gs	J	Colonoscopy and polypectomy, 53yo M, etc., outpt	339	3
an	P	Anesth for carotid endarterectomy	340	3
or	C	Bunionectomy, Keller/McBride/Mayo type, 45yo F, etc.	365	3
ot	M	Tracheostomy, emerg proc, transtracheal, adlt, etc.	397	3
an	T	Anesth for craniectomy or craniotomy	435	3
ra	A	Cervicocerebral angiography, selective catheter, etc.	463	3
or	G	Reduction unstable closed comminuted fx distal radius, etc.	501	3
an	K	Anesth for rep of AAA	509	3
op	N	Panretinal photocoagulation, tot tx, one eye, etc.	532	3
or	D	Arthroscopic partial menisectomy, 22yo M, knee trauma, etc.	557	3
mx	U	Unilat arthroscopy of temperomandibular joint	615	3
an	A	Anesth for CABG w pump oxygenator	615	3
mx	V	Placement of 4 maxill endosseous implants	639	3
op	L	Glaucoma filtering proc, primary, trabeculotomy	680	3
ur	M	Extracorporeal shock wave lithotripsy, etc., 2 cm renal stone	910	3
mx	W	Unilat meniscoplasty, temporomandibular joint	1056	3
Hospital invasive services				
pe	K	Intubation of newborn	92	2
ts	L	Thoracentesis, tot evac, effusion and suspected pulm tumor	106	2
gs	B	Chest tube insertion for spontaneous pneumothorax in 20yo	108	2
ts	B	Chest tube insertion for spontaneous pneumothorax, in 20yo	108	2
py	P	Electroconvulsive ther, 1x seizure, 82yo widowed M hosp, etc.	108	2
an	H	Insertion of Swan Ganz catheter	139	2
gs	X	Insertion of Swan-Ganz catheter	139	2
ot	R	Closed reduction nasal fx, stabilization, post trauma 20yo M	155	2
pe	A	Attendance in delivery room w resus of 2000 gram infant	167	2

Table 69 continued

Results of statistical cluster analysis of intra-service work, by broad service class and statistically assigned levels of work per unit time (W/T)

Specialty	Service description		Mean[1] intra-service work	Statistically assigned level of W/T
ts	M	Init pericardiocentesis, 35yo M post chest trauma	169	2
gs	F	Tonsillectomy and adenoidectomy in 10yo child	171	2
ot	*	Tonsillectomy and adenoidectomy in 10yo child	171	2
ob	Y	Intracavitary radioelement app, pt w cervical cancer, etc.	186	2
ot	G	Dir laryngoscopy w biopsy, suspected CA, 50yo M, gen anesth	212	2
mx	G	Extract 10 erupted mandib teeth, 60yo M on Persantine, etc.	213	2
ur	Q	Cystourethroscopy w insertion of indwelling ureteral stent	226	2
ob	E	Normal uncomplicated labor, multipara, no risk, 1x w pt	232	2
fp	D	Appendectomy, acute abdomen w unperforated appendicitis	234	2
ob	M	Uncomplicated spontaneous vaginal delivery	241	2
fp	H	Uncomplicated spontaneous vaginal delivery	251	2
gs	*	Uncomplicated indir inguinal hernia rep, 45yo M	263	2
ts	*	Permanent single chamber cardiac pacemaker implantation, etc.	284	3
ob	I	Ovarian cystectomy, unilateral, uncomplicated, in 25 yo	307	3
ob	G	Preterm labor, req tocolysis, etc., 1x spent w pt	324	3
gs	H	Appendectomy, acute abd w unperforated appendicitis	326	3
mx	D	Remov 4 impact (full bony) wisdom teeth, 1x hosp proc, 21yo M	342	3
ts	J	Mediastinoscopy in pt w suspected paratracheal lymph nodes	344	3
mx	O	Unilat Caldwell-Luc proc, etc., w antral polyp remov	350	3
ot	T	Unilat Caldwell-luc proc, maxill sinus disease, polyp remov	350	3
ob	F	Labor, moderate hypertension, etc., 1x spent w pt	363	3
fp	G	Abdominal hysterectomy, cancer in situ of cervix, 50yo F	366	3
ob	Q	Uncomplicated cesarean delivery, cephalopelvic disproportion	367	3
ot	O	Uvulopalatal pharyngoplasty, upper airway obstruction	416	3
ur	K	Cystoscopic laser ther superficial bladder tumor, in hosp	435	3
ob	H	Protracted labor req pitocin, etc., 1x spent w pt	439	3
op	I	Lid surg, two-lid blepharoplasty, both upper lids	443	3
mx	P	Closed reduction mandib fx by manipulation, etc.	467	3
ur	T	Uncomplicated indirect inguinal hernia repair, 45yo M	470	3
ob	J	Abdominal hysterectomy, cancer in situ of cervix, 50 yo	504	3
op	T	Refractive surg, radial keratotomy	512	3

Table 69 continued

Results of statistical cluster analysis of intra-service work, by broad service class and statistically assigned levels of work per unit time (W/T)

Specialty	Service description		Mean[1] intra-service work	Statistically assigned level of W/T
ur	C	Fulguration and resection medium bladder tumor, 2-5 cm 65yo M	519	3
op	K	Commitant strabismus surg, primary, etc., in a child	532	3
ob	V	Vaginal hysterectomy, anterior and posterior colporrhaphy	545	3
ts	Q	Insertion, mgmt, & remov balloon pump, post CABG, etc.	550	3
op	E	Secondary lens implant, wo vitrectomy	597	3
gs	K	Cholecystectomy for cholelithiasis	607	3
gs	L	Abdominal hysterectomy, cancer in situ of cervix, 50yo F	669	3
ur	E	Insertion non-inflatable, semi-rigid, penile prosth, 60yo M	692	3
ot	F	Septorhinoplasty, primary rhinoplasty septal rep, 25yo M	764	4
gs	D	Modified radical mastectomy	768	4
ur	N	Ureteroscopy w remov of calculus	835	4
op	J	Extracapsular cataract extract w IOL	846	4
or	F	Open reduction and int fixation, intertrochanteric fx 80yo F	881	4
ts	O	Carotid endarterectomy, unilat, 58yo F, hx ischemic attacks	906	4
mx	T	Open tx, mult fx zygomatic arch and malar tripod, etc.	908	4
ur	H	Transurethral resection of prostate, TURP, etc., BPH 70yo M	919	4
mx	Q	Open surgical tx, complex mandib fx, etc.	955	4
op	M	Scleral buckle, wo vitrectomy, primary	1028	4
ot	H	Tympanoplasty w mastoidectomy for cholesteatoma in adlt	1070	4
or	E	Unilat lumbar laminectomy, excision intervertebral disc, etc.	1074	4
ot	L	Parotidectomy, lateral lobe, dissection, etc.	1102	4
ts	H	Left upper pulm lobectomy, for squamous bronchogenic ca	1125	4
ur	L	Percutaneous nephrostolithotomy, 1 stage, 2 cm stone or less	1167	4
gs	G	Low anterior resection for rectal CA	1174	4
ot	P	Cochlear implant, child, bilat sensorineural hearing loss	1176	4
mx	I	Bilat sagitt osteotomy, mandib ramus 20yo F, etc.	1176	4
op	A	Penetrating keratoplasty, cataract extract and IOL implant	1220	4
or	T	Laminectomy, decompression spinal cord, cauda equina, etc.	1435	4
ts	I	Prosth graft repl 10 cm abd infrarenal aortic aneurysm, etc.	1452	4
or	A	Primary tot hip replacement for osteoarthritis	1486	4
ts	P	Rep ventricular septal defect in 5yo child	1566	4

Table 69 continued

Results of statistical cluster analysis of intra-service work, by broad service class and statistically assigned levels of work per unit time (W/T)

Specialty	Service description		Mean[1] intra-service work	Statistically assigned level of W/T
ot	A	Laryngectomy, w radical neck dissection for cancer in 65yo M	1643	4
ts	T	Primary aortic valve repl 50yo F, prosth valve, etc.	1711	4
ts	D	Primary CABGx3, 65yo M, etc., no complicating assoc disease	1713	4
gs	A	Tot esophagectomy w gastroesophageal anastomosis in chest	1776	4
ts	S	Tot esophagectomy w gastroesophageal anastomosis in chest	1776	4
ot	Q	Acoustic neuroma resection in adlt, translabyrinthine	1965	4
mx	A	LeFort 1 maxill and sagit split mandib osteotomies, etc.	1974	4
ur	A	Tot cystectomy and ileal loop, urinary diversion, etc.	2426	4
ts	A	Redo CABGx3, 1st reop 68yo M, 3 yr post graft, etc.	2444	4

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[1] Reported mean is the antilogarithm of the mean of the common logarithm of work.

[2] Three invasive imaging procedures are included in this broad service class.

Table 70

Results of the clustering of intra-service work for three broad classes of service, three levels[1]

Broad service class	Number of services	Mean intra-service work	Standard error as a percentage of mean	Range of intra-service work Min	Max
Non-invasive					
Level 1[2]	40	33	5.6	14	50
Level 2	72	85	2.8	54	122
Level 3	51	176	3.9	124	378
Office and surgical invasives and anesthesia					
Level 1	25	55	7.7	19	79
Level 2	35	127	4.4	89	224
Level 3	29	417	8.2	231	1055
Hospital invasive					
Level 2	18	173	8.2	92	263
Level 3	26	439	5.0	284	692
Level 4	31	1243	6.2	764	2444

[1] The mean, standard error, and range are reported on the untransformed scale and are based on the antilogarithms of the cluster results.

[2] The levels refer to the level of W/T assigned to the cluster.

Table 71

Services for which assigned level of work per minute time (W/T) was adjusted based on clinical judgment

Specialty	Service	Service description	Mean[1] intra-service work	Statistically assigned level of W/T	Adjusted level of W/T
Non-invasive services					
pe	J	2:00 A.M. phone call for crying child under 12 months	31	1	2
fp	X	Phone consult, pt home, 1:30 A.M., belching, etc.	49	1	2
py	U	Ov individ psychoanalysis 42yo, passive-aggressive, etc.	125	3	2
rh	H	Init off eval pt, negative lab and x-ray studies, fibrositis	149	3	2
im	M	Dir hosp adm of 62yo smoker, est pt, respiratory distress	154	3	2
ra	K	MRI spinal cord, incl spine, unexplained motor weakness, etc.	159	3	2
py	K	Group med psychother in-off, 6 pts seen weekly, etc.	160	3	2
ra	H	Computerized tomography guidance needle biopsy, etc.	208	3	2
Office and surgical center invasive services					
ai	G	1x inj for immunother, antigen supp by another source	19	1	2
dm	I	Off revisit w est 63yo pt, laser tx hemangioma	65	1	2
fp	F	Incision & drainage of peri-anal abscess, off proc	77	1	2
ai	C	Percutaneous tsts w allergenic extracts (1st 30)	77	1	2
pe	N	Lumbar puncture of 5yo for suspected meningitis	78	1	2
ob	S	Perf of amniocentesis at 16 weeks gestation	124	2	3
mx	C	Remov 4 impact (full bony) wisdom teeth, 1x off proc, 21yo M	287	3	2
or	C	Bunionectomy, Keller/McBride/Mayo type, 45yo F, etc.	365	3	2
mx	U	Unilat arthroscopy of temperomandibular joint	615	3	2
Hospital invasive services					
pe	K	Intubation of newborn	92	2	3
an	H	Insertion of Swan Ganz catheter	139	2	3
gs	X	Insertion of Swan-Ganz catheter	139	2	3
pe	A	Attendance in delivery room w resus of 2000 gram infant	167	2	3
fp	H	Uncomplicated spontaneous vaginal delivery	251	2	3
ot	F	Septorhinoplasty, primary rhinoplasty septal rep, 25yo M	764	4	3
ur	N	Ureteroscopy w remov of calculus	835	4	3
ur	H	Transurethral resection of prostate, TURP, etc., BPH 70yo M	919	4	3

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[1] Reported mean is the antilogarithm of the mean of the common logarithm of work.

Table 72

A comparison of surveyed and assigned rate of work per unit of time (W/T)

Specialty/Service description		Work per unit of time (W/T) (Work per minute)	
		Surveyed[1]	Assigned
gs T	Hospital admission, 45-year-old female with acute cholecystitis	2.89	2.80
gs U	Hospital visit, 3 days post uncomplicated cholecystectomy with common bile duct exploration	3.21	2.80
ur B	Follow-up hospital visit 2 days post uncomplicated TURP in 70-year-old male	3.61	3.44
ts C	Follow-up hospital visit, day 1 post-op chest tube insertion for spontaneous pneumothorax in 20-year-old	4.00	3.44
or B	Day 3 or 4 post-op follow-up of 80-year-old female with repair of intertrochanteric fracture	4.69	4.85
ts E	Hospital visit, day 2 post-op, following triple coronary artery bypass graft, 65-year-old male, with no complicating associated disease	6.05	4.85

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[1] We surveyed portions of pre- and post-services for work in our national survey of physician work where we had also surveyed the work of the corresponding intra-service. Surveyed work per minute values are derived from mean surveyed responses for work and time from these portions of pre- and post-services.

Table 73

Mean pre-, intra-, and post-service work and the percentage of pre- and post-service work to total-service work

Specialty	Service	Service description	Cross-specialty work Pre-service	 Intra-service	 Post-service	 Total-service	Percentage pre & post of total work
Office evaluation and management services							
py	K	Group med psychother in-off, 6 pts seen weekly, etc.	12	160	19	190	16
fp	X	Phone consult, pt home, 1:30 A.M., belching, etc.	0	49	10	59	16
im	W	Phone consult pt home, 1:30 A.M., belching, etc.	0	66	14	80	17
pe	T	Phone call during off hours for child w rash on Amoxicillin	0	17	4	21	17
im	V	Off phone consult re: poss adverse drug react in est pt	0	28	6	34	18
pe	J	2:00 A.M. phone call for crying child under 12 months	0	31	8	39	20
py	U	Ov individ psychoanalysis 42yo, passive-aggressive, etc.	12	125	19	156	20
py	S	Ov diag reeval 68yo F, chronic depression, unresponsive tx	14	144	23	181	21
py	G	Ov, term 66yo business executive 2x weekly psychother, etc.	12	114	19	145	21
fp	W	Comp well child visit at 6 months, est pt (AAP guidelines)	5	50	9	64	22
pe	C	Comp well child visit at 6 months, est pt (AAP Guidelines)	5	50	9	64	22
py	*	2nd ov after referral from internist, 25yo M panic attacks	12	103	19	133	23
py	C	Foll-up psychother ov, 48yo housewife for tx of agoraphobia	12	102	19	133	23
py	H	Weekly med psychother and pharmacother ov, 36yo F, etc.	12	100	19	130	23
fp	L	Ov, est pt, 6yo child w sore throat and headache	4	39	8	51	24
fp	M	Off eval, poss purulent conjunctivitis 16yo F, est pt	3	32	7	43	24
im	H	Off eval, poss purulent conjunctivitis 16yo F, est pt	3	32	7	43	24
pe	R	Off eval, poss purulent conjunctivitis 16yo F, est pt	3	32	7	43	24
dm	J	Init ov, 16yo M w severe cystic acne, new pt	6	62	14	82	24
im	B	Ov, sore throat, fever, fatigue 19yo college student, est pt	3	37	9	49	25
ot	B	Ov, sore throat, fever, fatigue, 19yo college student, est pt	3	37	9	49	25
py	B	Phone conv, retarded mother of 18yo schizophrenic M, etc.	0	56	18	75	25
ob	A	Init off eval secondary amenorrhea, 22 yo new pt, etc.	13	112	27	152	26
im	F	Init off eval, diagnosis and mgmt hematuria, etc.	5	99	33	137	27
dm	G	Off revisit for eval of 28yo M w onychomycosis	4	27	6	38	27
fp	B	Off revisit for eval of 28yo M w onychomycosis	4	27	6	38	27
ai	P	Med conf w pt. and/or family, counseling for avoidance, etc	19	104	22	145	28
dm	T	Init comp eval 30yo F w symptoms of SCLE	12	87	23	121	29
fp	O	Ov 45yo M, est pt, chronic asthma, on chronic steroid, etc.	8	57	15	80	29
im	I	Ov 45yo M, est pt, chronic asthma, on chronic steroid, etc.	8	57	15	80	29

Table 73 continued

Mean pre-, intra-, and post-service work and the percentage of pre- and post-service work to total-service work

			Cross-specialty work				Percentage pre & post of total work
Specialty	Service	Service description	Pre-service	Intra-service	Post-service	Total-service	
rh	N	Ltd ov, est pt known osteoarthritis and painful swollen knees	6	49	14	69	29
ai	B	OV, est pt, 6yo child w sore throat and headache	6	47	13	66	29
fp	Y	1x supervs conf w nurse, antibiotic ther, est pt w SBE	6	43	12	61	29
im	X	1x supervs conf w nurse, antibiotic ther, est pt w SBE	6	43	12	61	29
py	O	Ov chemother for mgmt of 44yo M w bipolar depression	12	73	19	103	30
ob	P	Ov postpartum care 6 weeks, uncomplicated vaginal delivery	7	50	14	71	30
or	H	Comp init off visit for eval 13yo F w progressive scoliosis	11	103	32	146	30
rh	H	Init off eval pt, negative lab and x-ray studies, fibrositis	22	149	41	212	30
fp	*	Foll-up visit 55yo M, mgmt hypertension, beta/thiazide	6	44	13	62	30
im	*	Foll-up visit 55yo M, mgmt hypertension, beta/thiazide	6	44	13	62	30
ai	O	OV 45yo M, est pt, chronic asthma, on chronic steroid, etc	15	86	23	123	30
or	N	1st visit eval and counseling 28yo M runner, knee/calf pain	7	69	23	99	31
im	S	Init eval and mgmt of recurrent urinary tract inf in F	9	80	26	116	31
ur	O	Init eval and mgmt of recurrent urinary tract inf in F	9	80	26	116	31
gs	R	Foll-up visit, post tx, pt w primary breast cancer	7	44	13	64	31
rh	*	Foll-up ov, etc., Stage II, Class II, rheumatoid arthritis	7	47	14	68	31
dm	*	Foll-up visit w 48yo M ongoing mgmt psoriasis not PUVA tx	5	29	9	42	31
rh	K	Init off eval & mgmt pt, vasculitis and circulation	41	250	72	363	31
gs	Q	Foll-up ov, 60yo est pt 8 weeks post partial colectomy, etc.	7	37	10	54	31
pe	*	Ov, est pt, 6yo child w sore throat and headache	5	29	9	42	31
op	S	Off eval poss purulent conjunctivitis 16yo F, est pt	5	31	9	45	32
ob	D	Ext foll-up prenatal visit at 36-37 weeks, etc.	11	73	23	107	32
ob	B	Limited prenatal foll-up visit, hx and exam, etc.	8	38	10	56	32
op	B	Foll-up exam, est pt, incl visual acuity, slit lamp, etc.	6	36	11	53	32
ob	Z	Ov counseling 25yo primigravida, family hx of Downs Syndrome	17	109	35	161	32
ur	J	Init eval and mgmt of recurrent renal calculi in 40yo M	18	112	36	166	33
pe	E	Comp well child visit at 5 years, new pt (AAP Guidelines)	15	68	19	101	33
ai	K	Prof svcs for supervs and prov antigens, allergen immunother	12	72	23	108	33
fp	Q	Off eval 28yo pt regional enteritis, diarrhea, est pt	11	88	32	131	33
im	L	Off eval 28yo pt regional enteritis, diarrhea, est pt	11	88	32	131	33

Table 73 continued

Mean pre-, intra-, and post-service work and the percentage of pre- and post-service work to total-service work

			Cross-specialty work				Percentage
Specialty	Service	Service description	Pre-service	Intra-service	Post-service	Total-service	pre & post of total work
fp	P	Off eval new onset right lower quad pain in 32yo F, est pt	10	92	36	138	33
gs	S	Off eval new onset right lower quad pain in 32yo F, est pt	10	92	36	138	33
im	J	Off eval new onset right lower quad pain in 32yo F, est pt	10	92	36	138	33
ob	L	Off eval new onset right lower quad pain in 32 yo F, est pt	10	92	36	138	33
rh	J	Foll-up visit 40yo mother, Stage III, Class III, etc.	16	99	33	148	33
ai	*	Foll-up ov for pharmacological mgmt of 30yo F w hay fever	8	40	12	60	33
rh	I	Foll-up visit 45yo, rheumatoid arthritis on gold, etc.	12	72	24	107	33
pe	I	Off eval head trauma, pre-school child w vomiting, est pt	12	70	23	105	34
pe	B	Off eval of diaper dermatitis, est pt	3	16	5	24	34
ot	I	Eval recurrent dizziness and vertigo 48yo F, incl hx, etc.	16	97	32	145	34
ai	N	Init off eval of adlt w chronic recurrent hives, new pt	22	158	59	239	34
ot	N	Eval hoarseness and dysphagia, 65yo M incl hx and physical	13	77	26	116	34
ur	F	Init consult for infertility in 35yo M	18	106	36	159	34
pe	L	Poss of sexual abuse in 5yo F, new pt	19	113	38	170	34
rh	M	Foll up off consult, 45yo M ankylosing spondylitis, etc.	13	76	26	115	34
ur	D	Off eval new onset right lower quad pain 32yo F, est pt	14	80	27	121	34
ur	G	Init off eval diagnosis & mgmt painless gross hematuria, etc.	16	89	30	135	34
dm	C	Init ov, eval and counseling 17yo F w primary genital herpes	12	66	22	100	34
fp	K	Init visit pregnancy 25yo primigravida, hx and exam, etc.	21	122	42	185	34
ob	C	Init visit pregnancy 25 yo primigravida, hx and exam, etc.	21	122	42	185	34
ob	U	Init ov eval and counseling 17 yo F w primary genital herpes	16	89	31	136	34
dm	E	Init ov, 35yo M w complaint of alopecia	10	59	20	89	34
dm	R	Init off eval, adlt w chronic recurrent hives, new pt	13	75	26	114	35
pe	H	Init visit of adolescent F w abd pain, new pt	16	91	32	139	35
pe	S	Init ov for eval of child w chronic wheezing	14	76	27	117	35
ot	S	Rhinoplasty eval, 25yo F, incl hx, physical, etc.	17	93	33	144	35
fp	N	Routine gyn exam, 24yo est pt, wo complaints	11	59	21	91	35
ob	K	Routine gyn exam, primary care phys, est pt, wo complaints	11	59	21	91	35
pe	O	Foll-up visit, adolescent w behavior problem, etc., est pt	16	86	31	133	35
pe	F	Comp well child visit at 15 years, new pt (AAP Guidelines)	15	78	28	121	36
pe	D	Comp well child visit at 2 years, est pt (AAP Guidelines)	10	54	20	85	36

Table 73 continued

Mean pre-, intra-, and post-service work and the percentage of pre- and post-service work to total-service work

Specialty	Service	Service description	Cross-specialty work				Percentage pre & post of total work
			Pre-service	Intra-service	Post-service	Total-service	
rh	A	Init off eval SLE, fever, seizures and thrombocytopenia	49	263	100	413	36
ai	F	Init ov for eval of child w chronic wheezing	22	152	65	238	36
ai	L	Eval of 6yo M w mult infs, new pt	24	162	69	256	37
ot	C	Init off eval gradual hearing loss, 58yo M, hx, etc.	14	72	27	113	37
ob	X	Init ov 34 year pt w primary infertility, incl counseling	29	146	58	233	37
fp	U	Off consult psych exam 25yo M, intellect deterioration, etc.	27	132	53	212	38
op	O	Contact lens eval and fitting, incl comp eye exam, etc.	25	116	46	186	38
or	K	Intermed ov, est pt known osteoarthritis and swollen knees	9	54	24	87	38
im	K	Ov eval recent onset syncopal attacks, 70yo F, est pt	26	126	52	204	38
op	D	Consult/ext eval complex ophthalmic problem, etc.	24	108	44	176	38
op	C	Comp eye exam, adlt pt w no specific complaints, hx, etc.	13	61	25	99	39
gs	P	Comp ov, init eval 48yo M recurrent low back pain to leg	19	99	44	162	39
or	I	Comp ov, init eval 48yo man recurrent low back pain to leg	19	99	44	162	39
im	T	Init off eval of a 37 generally well M	16	72	29	117	39
mx	L	Ov 45yo F smoker w small oral ulcer on lateral border tongue	9	50	23	82	39
py	T	Ov family psychother, 38yo father incestuous w 12yo daughter	42	197	84	322	39
rh	C	Init off eval of 70yo F w polyarthralgia	35	163	69	267	39
py	Q	Eval 24yo M, murder, competency to stand trial, etc.	83	378	165	626	40
py	E	Eval records and reports, 69yo F, pre-syncopal episodes, etc.	30	135	58	223	40
rh	O	Comp init eval 48yo M recurrent back pain radiating to leg	34	153	67	255	40
py	V	Court-requested eval juvenile, attempted rape a 71yo F, etc.	65	283	127	475	41
py	X	Prep report to DMH halfway house coord, 3-week hosp, etc.	32	135	62	229	41
ts	N	Init off eval 50yo M w aortic aneurysm, to recommend surg	34	113	50	197	42
mx	K	Comp eval 28yo F, 2 year hx facial/TMJ pain, etc.	32	134	70	235	43
ts	U	Eval 65yo M,chronic stable angina and coronary artery disease	49	127	52	228	44
ts	K	Ext init off eval of 70yo F w increasing dysphagia	45	131	61	237	44
py	M	Ov diag interview & eval 17yo M, personality change, etc.	64	183	90	337	46
py	N	Off consult psych eval 65yo M, intellect deterioration, etc.	66	181	88	335	46
mx	B	Ov to advise remov wisdom teeth, 18yo M, etc.	10	26	14	50	48
gs	O	Preoperative eval new pt w primary hyperparathyroidism	54	124	96	274	55

Table 73 continued

Mean pre-, intra-, and post-service work and the percentage of pre- and post-service work to total-service work

Specialty	Service	Service description	Cross-specialty work Pre-service	Intra-service	Post-service	Total-service	Percentage pre & post of total work
Hospital evaluation and management services[1]							
py	R	1x supervisory conf, team RNs, SWs, andn MHWs, psych unit	14	152	23	190	20
py	I	Family psychother, husband of 28yo F, bipolar illness, etc.	14	149	23	186	20
pa	N	Consult for transfusion react in pt w fever and back pain	...	74	...	98	25
pa	K	Consult in an intrapartum bleeding diathesis	...	88	...	119	26
im	O	Hosp visit, day 3 days post adm, 65yo M uncomplicated MI, est pt	14	70	19	104	32
gs	U	Hosp visit, 3 days post uncomplicated cholecystectomy, etc.	8	35	9	52	33
or	B	Day 3 or 4 post-op foll-up, 80yo F, rep intertrochanteric fx	10	48	13	71	33
im	M	Dir hosp adm of 62yo smoker, est pt, respiratory distress	17	154	60	231	33
pe	G	Hosp adm for 18 month old child w 10% dehydration	19	126	47	191	34
ts	E	Hosp visit, day 2 post-op, CABGx3, 65yo M, no assoc disease	20	77	22	120	35
ur	B	Foll-up hosp visit 2 days post uncomplicated TURP in 70yo M	10	35	9	54	36
an	V	Consult for transfusion react in pt w fever and back pain	22	111	42	175	36
dm	P	Hosp consult, poss drug eruption, 50yo M	20	98	36	154	36
im	G	Emerg hosp consult, 72yo, new pt, w poss bowel obstruction	28	187	80	295	37
im	N	Foll-up hosp visit, day 2, pt non-dominant CVA, etc.	15	60	20	95	37
ai	R	Dir hosp adm of 62yo smoker, est pt, respiratory distress	33	205	88	327	37
rh	D	Consult hosp, 35yo F, fever, swelling joints, rash, etc.	42	211	83	336	37
ai	E	Dir hosp adm, yng adlt pt, failed prev ther, asthmtic attack	38	199	82	318	38
py	W	Eval & level care decision 17yo adolescent, schizo, etc.	34	178	78	290	39
py	D	Hosp consult, psych eval 68yo surg, post-op depression	33	172	76	282	39
py	J	Mult family group med psychother of families, in-pts, etc.	33	191	87	312	39
fp	A	Dir hosp adm yng adlt est pt, acute asthma attack	34	151	62	247	39
ur	S	Init eval and mgmt of unexplained renal failure in a 40yo F	34	141	56	231	39
py	F	Repeat hosp visit stabilized 42yo M, schizophrenia, etc.	15	58	22	94	39
an	N	Eval 63yo pt, ICU w diabetes and chronic renal failure, etc	35	167	73	274	39
gs	T	Hosp adm, 45yo F w acute cholecystitis	22	107	54	183	42
im	R	Hosp consult for diagnosis/mgmt of fever foll abdominal surg	44	146	66	256	43
fp	V	Emerg hosp consult, 72yo, new pt, w poss bowel obstruction	43	159	80	282	44
gs	W	Emerg hosp consult, 72yo, new pt, poss bowel obstruction	43	159	80	282	44
ts	F	Init hosp eval pulm tumor 45yo smoker, prev in good health	50	122	46	218	44
ts	C	Foll-up hosp visit, day 1 post-op chest tube insertion, etc.	16	36	17	68	48

Table 73 continued

Mean pre-, intra-, and post-service work and the percentage of pre- and post-service work to total-service work

Specialty	Service	Service description	Cross-specialty work Pre-service	Intra-service	Post-service	Total-service	Percentage pre & post of total work
Nursing home evaluation and management services							
fp	R	Sched monthly NH visit to est pt w Organic Brain Syndrome	10	50	14	74	33
im	P	Sched monthly NH visit to est pt w Organic Brain Syndrome	10	50	14	74	33
fp	S	NH visit, unsched, eval pt w fever and obtundation, etc.	21	100	37	159	37
im	Q	NH visit, unsched, for eval pt w fever and obtundation, etc.	27	118	48	192	39
Emergency unit evaluation and management services							
gs	Y	Triage, resus and hosp adm from ER, 52yo, alcoholic, etc.	40	340	128	509	33
py	A	ER eval, intervention 25yo M, voices, attempt stab, etc.	53	300	111	465	35
or	J	Init eval, mgmt mult trauma pt, complex pelvic fx, 35yo M	95	290	64	448	35
gs	V	Init eval mgmt mult trauma pt w complex pelvic fx, 35yo M	43	279	118	440	37
py	L	Hosp ER eval 78yo F, ingested alcohol and valium, suicide	39	197	81	317	38
im	A	Mgmt pt acute pulm edema in ER, subsequently adm hosp, est pt	35	230	107	372	38
fp	T	Mgmt pt acute pulm edema in ER, subsequent hosp adm, est pt	35	174	73	282	38
Office invasive services							
mx	C	Remov 4 impact (full bony) wisdom teeth, 1x off proc, 21yo M	34	287	26	348	17
op	N	Panretinal photocoagulation, tot tx, one eye, etc.	78	532	79	689	23
or	M	Closed reduction, subluxation head radius, 4yo M, off setting	15	73	20	108	32
dm	N	Excision & intermed rep of 4 by 6 mm BCE of forehead 30yo F	38	155	41	234	34
dm	M	C&E of 10 by 12 mm (BCE) of cheek of 60yo M	29	108	30	167	35
ai	J	Inhalation bronchial challenge tstg w histamine, etc	45	156	44	244	36
ot	U	Remov of foreign body from ear canal wo gen anesth	18	64	19	100	36
ur	I	Diag cystoscopy, off proc in M w microhematuria	27	95	28	150	36
mx	H	Extract of abscessed tooth in a healthy 40yo M	16	51	14	81	37
mx	J	Excision of 0.5 cm benign lesion of the lip in a 60yo F	22	73	21	115	37
ob	N	Colposcopy abnorm cervical cytology, Pap smear, w biopsy	34	120	37	190	37
ai	D	Intradermal tsts w allergenic extracts (1st 10)	19	76	26	121	37

Table 73 continued

Mean pre-, intra-, and post-service work and the percentage of pre- and post-service work to total-service work

Specialty	Service	Service description	Cross-specialty work Pre-service	Intra-service	Post-service	Total-service	Percentag pre & pos of tota work
fp	E	Rigid sigmoidoscopy, wo biopsy, in off	21	74	23	117	37
im	D	Rigid sigmoidoscopy, wo biopsy, in off	21	74	23	117	37
dm	L	Shave/punch biopsy probable skin cancer	17	58	18	93	38
fp	C	Rep of 2 inch laceration of scalp, 14yo M, off setting	22	75	25	121	38
pe	P	Rep of 2 inch laceration of scalp, 14yo M, off setting	22	75	25	121	38
ur	P	Cystometrogram calibrated electronic equipment, etc.	34	115	38	187	38
dm	A	Excision changing pigmnted lesion back, 6x4 mm, 52yo M	30	101	33	164	38
dm	U	Excision of 2 facial nevi, 20yo M, 8 and 4 mms respectively	32	105	36	173	39
mx	*	Expos 1x impact cuspid, off, 14yo future ortho tx, etc.	33	89	26	148	40
dm	Q	X-ray ther, BCE tip of nose 65yo F, 1x tx, not entire course	17	53	18	88	40
pe	N	Lumbar puncture of 5yo for suspected meningitis	25	78	27	130	40
dm	B	Cryodest mult, 3 to 4, facial actinic keratoses, 65yo farmer	14	41	15	70	41
ai	A	Intracut, intradermal, tsts insects, immed react, 11-15 tsts	48	151	59	259	42
op	Q	Fluorescein angiography diabetic retinopathy, etc., interp	34	101	39	174	42
dm	O	Liquid nitrogen cryodestruction 3 verrucae hands of 14yo M	14	40	15	69	42
pe	M	Closed reduction, subluxation, head of radius at elbow, 4yo M	13	37	14	64	43
ai	M	A&R of intradermal tsts w antigens, immune deficiency eval	18	63	29	111	43
pe	U	Remov of foreign body from ear canal wo gen anesth	16	45	18	79	43
fp	F	Incision & drainage of peri-anal abscess, off proc	27	77	31	135	43
ai	C	Percutaneous tsts w allergenic extracts (1st 30)	21	77	37	135	43
gs	I	Rigid sigmoidoscopy, wo biopsy, in off	22	61	25	108	44
im	C	Aspiration of synovial fluid from knee	20	52	21	93	44
or	R	Aspiration of synovial fluid from knee, off proc	20	52	21	93	44
rh	E	Aspiration of synovial fluid from knee	20	52	21	93	44
rh	G	Inj corticosteroid prep into tendon sheath or trigger point	15	39	16	70	44
ai	I	Fibroscopic exam nasal, choanal, pharynx for nasal polyps	39	100	40	178	44
dm	I	Off revisit w est 63yo pt, laser tx hemangioma	25	65	29	119	45
dm	F	Intralesional inj, triamcinolone	10	24	11	45	47
dm	K	Photochemother (PUVA), scheduled tx during ther	14	32	16	62	49
ai	G	1x inj for immunother, antigen supp by another source	12	19	10	41	55

Table 73 continued

Mean pre-, intra-, and post-service work and the percentage of pre- and post-service work to total-service work

			Cross-specialty work				Percentage
Specialty	Service	Service description	Pre-service	Intra-service	Post-service	Total-service	pre & post of total work
Hospital invasive services							
ob	E	Normal uncomplicated labor, multipara, no risk, 1x w pt	15	232	3	250	07
ob	H	Protracted labor req pitocin, etc., 1x spent w pt	32	439	34	506	13
ob	F	Labor, moderate hypertension, etc., 1x spent w pt	26	363	34	423	14
py	P	Electroconvulsive ther, 1x seizure, 82yo widowed M hosp, etc.	14	108	18	141	23
ot	L	Parotidectomy, lateral lobe, dissection, etc.	153	1102	400	1655	33
ur	H	Transurethral resection of prostate, TURP, etc., BPH 70yo M	155	919	314	1388	34
ob	M	Uncomplicated spontaneous vaginal delivery	11	241	114	366	34
ur	A	Tot cystectomy and ileal loop, urinary diversion, etc.	258	2426	1037	3722	35
or	T	Laminectomy, decompression spinal cord, cauda equina, etc.	189	1435	592	2216	35
ts	A	Redo CABGx3, 1st reop 68yo M, 3 yr post graft, etc.	219	2444	1219	3883	37
or	A	Primary tot hip replacement for osteoarthritis	175	1486	701	2363	37
or	E	Unilat lumbar laminectomy, excision intervertebral disc, etc.	169	1074	465	1709	37
ur	L	Percutaneous nephrostolithotomy, 1 stage, 2 cm stone or less	187	1167	510	1864	37
mx	A	LeFort 1 maxill and sagit split mandib osteotomies, etc.	367	1974	827	3169	38
ot	Q	Acoustic neuroma resection in adlt, translabyrinthine	240	1965	951	3156	38
fp	H	Uncomplicated spontaneous vaginal delivery	14	251	140	405	38
gs	K	Cholecystectomy for cholelithiasis	126	607	258	991	39
ts	P	Rep ventricular septal defect in 5yo child	226	1566	777	2569	39
ur	N	Ureteroscopy w remov of calculus	156	835	379	1370	39
gs	G	Low anterior resection for rectal CA	191	1174	577	1942	40
ot	A	Laryngectomy, w radical neck dissection for cancer in 65yo M	227	1643	856	2726	40
gs	L	Abdominal hysterectomy, cancer in situ of cervix, 50yo F	151	669	294	1114	40
ts	O	Carotid endarterectomy, unilat, 58yo F, hx ischemic attacks	172	906	441	1519	40
op	A	Penetrating keratoplasty, cataract extract and IOL implant	210	1220	651	2082	41
pe	A	Attendance in delivery room w resus of 2000 gram infant	14	167	104	285	41
ur	E	Insertion non-inflatable, semi-rigid, penile prosth, 60yo M	147	692	345	1184	42
ot	F	Septorhinoplasty, primary rhinoplasty septal rep, 25yo M	150	764	393	1307	42
ts	T	Primary aortic valve repl 50yo F, prosth valve, etc.	212	1711	1024	2947	42
ts	D	Primary CABGx3, 65yo M, etc., no complicating assoc disease	208	1713	1056	2978	42

Table 73 continued

Mean pre-, intra-, and post-service work and the percentage of pre- and post-service work to total-service work

Specialty	Service	Service description	Cross-specialty work Pre-service	Intra-service	Post-service	Total-service	Percentage pre & post of total work
an	H	Insertion of Swan Ganz catheter	41	139	65	244	43
gs	X	Insertion of Swan-Ganz catheter	41	139	65	244	43
ot	P	Cochlear implant, child, bilat sensorineural hearing loss	205	1176	690	2071	43
op	M	Scleral buckle, wo vitrectomy, primary	199	1028	602	1828	44
op	T	Refractive surg, radial keratotomy	136	512	270	918	44
gs	D	Modified radical mastectomy	168	768	442	1379	44
ur	C	Fulguration and resection medium bladder tumor, 2-5 cm 65yo M	136	519	280	936	44
gs	*	Uncomplicated indir inguinal hernia rep, 45yo M	81	263	132	476	45
gs	A	Tot esophagectomy w gastroesophageal anastomosis in chest	221	1776	1227	3224	45
ts	S	Tot esophagectomy w gastroesophageal anastomosis in chest	221	1776	1227	3224	45
op	K	Commitant strabismus surg, primary, etc., in a child	136	532	298	966	45
ot	H	Tympanoplasty w mastoidectomy for cholesteatoma in adlt	198	1070	679	1947	45
mx	I	Bilat sagitt osteotomy, mandib ramus 20yo F, etc.	338	1176	631	2145	45
ts	I	Prosth graft repl 10 cm abd infrarenal aortic aneurysm, etc.	211	1452	998	2662	45
ts	Q	Insertion, mgmt, & remov balloon pump, post CABG, etc.	136	550	331	1017	46
op	E	Secondary lens implant, wo vitrectomy	165	597	344	1107	46
op	J	Extracapsular cataract extract w IOL	195	846	539	1580	46
ob	V	Vaginal hysterectomy, anterior and posterior colporrhaphy	135	545	340	1020	47
mx	D	Remov 4 impact (full bony) wisdom teeth, 1x hosp proc, 21yo M	119	342	183	644	47
mx	P	Closed reduction mandib fx by manipulation, etc.	146	467	267	880	47
ur	T	Uncomplicated indirect inguinal hernia repair, 45yo M	131	470	286	886	47
mx	Q	Open surgical tx, complex mandib fx, etc.	210	955	639	1804	47
ur	K	Cystoscopic laser ther superficial bladder tumor, in hosp	129	435	258	822	47
ob	J	Abdominal hysterectomy, cancer in situ of cervix, 50 yo	124	504	330	958	47
gs	H	Appendectomy, acute abd w unperforated appendicitis	121	326	173	621	47
mx	T	Open tx, mult fx zygomatic arch and malar tripod, etc.	208	908	635	1752	48
or	F	Open reduction and int fixation, intertrochanteric fx 80yo F	158	881	671	1710	48
ts	J	Mediastinoscopy in pt w suspected paratracheal lymph nodes	120	344	204	667	49
op	I	Lid surg, two-lid blepharoplasty, both upper lids	128	443	294	865	49
ot	O	Uvulopalatal pharyngoplasty, upper airway obstruction	126	416	280	821	49
ts	H	Left upper pulm lobectomy, for squamous bronchogenic ca	196	1125	906	2227	50
ob	Q	Uncomplicated cesarean delivery, cephalopelvic disproportion	121	367	258	747	51

Table 73 continued

Mean pre-, intra-, and post-service work and the percentage of pre- and post-service work to total-service work

Specialty	Service	Service description	Cross-specialty work				Percentage pre & post of total work
			Pre-service	Intra-service	Post-service	Total-service	
mx	O	Unilat Caldwell-Luc proc, etc., w antral polyp remov	125	350	237	713	51
ot	T	Unilat Caldwell-luc proc, maxill sinus disease, polyp remov	125	350	237	713	51
ot	R	Closed reduction nasal fx, stabilization, post trauma 20yo M	77	155	85	317	51
ur	Q	Cystourethroscopy w insertion of indwelling ureteral stent	87	226	160	473	52
fp	G	Abdominal hysterectomy, cancer in situ of cervix, 50yo F	120	366	284	769	52
ot	G	Dir laryngoscopy w biopsy, suspected CA, 50yo M, gen anesth	86	212	149	448	53
fp	D	Appendectomy, acute abdomen w unperforated appendicitis	87	234	177	498	53
gs	F	Tonsillectomy and adenoidectomy in 10yo child	80	171	118	369	54
ot	*	Tonsillectomy and adenoidectomy in 10yo child	80	171	118	369	54
mx	G	Extract 10 erupted mandib teeth, 60yo M on Persantine, etc.	80	213	167	460	54
ob	I	Ovarian cystectomy, unilateral, uncomplicated, in 25 yo	115	307	242	664	54
pe	K	Intubation of newborn	14	92	99	205	55
ob	G	Preterm labor, req tocolysis, etc., 1x spent w pt	114	324	288	727	55
ob	Y	Intracavitary radioelement app, pt w cervical cancer, etc.	83	186	150	419	56
ts	*	Permanent single chamber cardiac pacemaker implantation, etc.	117	284	242	643	56
ts	M	Init pericardiocentesis, 35yo M post chest trauma	65	169	220	453	63
ts	L	Thoracentesis, tot evac, effusion and suspected pulm tumor	85	106	133	324	67
gs	B	Chest tube insertion for spontaneous pneumothorax in 20yo	63	108	187	359	70
ts	B	Chest tube insertion for spontaneous pneumothorax, in 20yo	63	108	187	359	70
Surgical center invasive services							
or	D	Arthroscopic partial menisectomy, 22yo M, knee trauma, etc.	112	557	68	737	24
mx	W	Unilat meniscoplasty, temporomandibular joint	247	1056	134	1437	27
ur	M	Extracorporeal shock wave lithotripsy, etc., 2 cm renal stone	188	910	162	1261	28
or	G	Reduction unstable closed comminuted fx distal radius, etc.	124	501	70	695	28
or	C	Bunionectomy, Keller/McBride/Mayo type, 45yo F, etc.	98	365	57	519	30
mx	V	Placement of 4 maxill endosseous implants	201	639	100	940	32
mx	U	Unilat arthroscopy of temperomandibular joint	198	615	105	918	33
op	L	Glaucoma filtering proc, primary, trabeculotomy	172	680	173	1024	34
gs	J	Colonoscopy and polypectomy, 53yo M, etc., outpt	115	339	64	518	35

Table 73 continued

Mean pre-, intra-, and post-service work and the percentage of pre- and post-service work to total-service work

Specialty	Service	Service description	Cross-specialty work Pre-service	 Intra-service	 Post-service	 Total-service	Percentage pre & post of total work
op	U	Excision of 0.5 cm basal cell CA, outer 1/3 lower eyelid	133	317	87	536	41
gs	M	Decompression carpal tunnel, 48yo F, unilat, ambulatory surg	98	193	56	347	44
or	*	Decompression carpal tunnel, 48yo F, unilat, ambulatory surg	98	193	56	347	44
ur	U	Bilat vasectomy, incl post-op semen examinations	124	253	81	458	45
ob	O	Laparoscopic tubal sterilization by fulguration in 35 yo	102	224	84	409	45
gs	N	Excision 0.5 cm basal cell CA, outer 1/3 lower eyelid	89	141	69	299	53
ot	E	Diagnostic fiberoptic bronchoscopy, bronchopulm lesion	104	199	121	424	53
ts	G	Primary diag fiberoptic bronchoscopy, bronchopulm lesion	104	199	121	424	53
ob	W	Elective term 1st trimester pregnancy, evac and curettage	91	152	98	341	55
ob	S	Perf of amniocentesis at 16 weeks gestation	101	124	95	320	61
op	*	1x chalazion proc, excision, left upper lid	50	48	30	127	62
ot	D	Bilateral tympanostomy tube insertion, etc., 2yo, gen anesth	82	104	100	287	64
ob	*	Diagnostic D&C for menometrorrhagia in 50 yo F	83	101	116	299	66
ur	*	Diag cystoscopy hosp, ambulatory surg, M w microhematuria	88	92	119	300	69
Emergency unit invasive services							
ot	M	Tracheostomy, emerg proc, transtracheal, adlt, etc.	23	397	77	497	20
gs	E	Tracheostomy, emerg proc, transtracheal, in adlt, etc.	23	288	77	388	26
ts	R	Tracheostomy, emerg proc, transtracheal, in adlt, etc.	23	288	77	388	26
Imaging services							
mx	R	Interp panoramic x-rays remov impacted wisdom teeth, etc.	0	26	0	26	0
mx	S	Perf and interp bilat Xray TMJ, open and closed, etc.	0	74	0	74	0
ob	R	Fetal ultrasound poss fetal abnorm, B-scan w image doc	0	152	0	152	0
op	F	Interp formal visual fields tsts, neuro purposes, adlt	0	41	0	41	0
op	G	IOL calculation, biometry/keratometry, A-mode	0	70	0	70	0
op	H	Diagnostic ultrasonography eye ball w interp, B-Mode, etc.	0	97	0	97	0
op	P	Interp of fundus photography	0	37	0	37	0

Table 73 continued

Mean pre-, intra-, and post-service work and the percentage of pre- and post-service work to total-service work

Specialty	Service	Service description	Cross-specialty work Pre-service	Intra-service	Post-service	Total-service	Percentage pre & post of total work
or	L	Interp lumbar spine X-rays, complete radiograph exam, etc.	0	36	0	36	0
or	O	Interp x-rays, tx comminuted fx distal radius, 3 views, etc.	0	42	0	42	0
or	P	Interp elbow x-rays: complete radiograph exam, for pain, etc.	0	29	0	29	0
or	Q	Interp foot x-rays, poss fx, complete radiograph exam, etc.	0	30	0	30	0
or	U	Interp hip x-rays, complete, for moderate/severe hip pain	0	34	0	34	0
rh	B	Interp x-rays, hands, bilateral, acute rheumatoid arthritis	0	21	0	21	0
rh	L	Interp bone density study, dual photon absorptiometry, etc.	0	30	0	30	0
rh	Q	Interp of hip x-rays, complete, for moderate/severe hip pain	0	21	0	21	0
ra	F	Interp computerized axial tomography, abd, etc., cancer	13	107	14	133	20
ra	J	Interp mammography, bilat, for 50yo pt w pain in breasts	5	50	11	66	24
ra	B	Interp chest x-rays, 2 views, frontal & lateral, etc.	2	18	4	24	26
ra	L	Interp complete abd incl decubitus, etc., intest obstruction	3	26	6	35	26
ra	O	Interp of complete skull series for headaches in an adlt	3	24	6	32	26
ra	P	Interp bone density study, dual photon absorbtiometry, etc.	4	30	7	41	26
ra	Q	Interp lumbar spine x-rays, complete radiograph exam, etc.	4	27	6	36	27
ra	C	Interp bilat rib x-rays, incl posteroanterior chest, etc.	3	24	6	33	27
ra	T	Interp of hip x-rays, complete, for moderate/severe hip pain	3	21	5	28	27
ra	I	Interp rad exam ankle, complete, min 3 views, etc., fx	2	14	4	20	27
ra	M	IV urography, pyelography incl kidneys, ureters, etc.	10	68	19	97	30
ra	G	Echography pregnant uterus, B-scan image doc, complete, etc.	16	117	33	166	30
ra	H	Computerized tomography guidance needle biopsy, etc.	30	208	61	299	30
ra	K	MRI spinal cord, incl spine, unexplained motor weakness, etc.	23	159	47	228	31
ra	N	Venography, unilat, complete proc, poss vein thrombosis, etc.	24	107	24	155	31
ra	E	Complete abd echography, B-scan, image doc, complete, etc.	15	100	31	147	32
ra	R	Hysterosalpingography, complete proc, 26yo F w infertility	15	91	29	135	33
ra	D	Barium enema, double contrast, complete proc, occult GI, etc.	15	90	29	134	33
ra	A	Cervicocerebral angiography, selective catheter, etc.	73	463	155	691	33
ra	*	Upper GI series, air contrast technique, KUB abd pain, etc.	13	59	16	89	33
or	S	Perf and interp a lumbar myelogram, 68yo F	32	177	65	275	35
ra	S	Perf & interp a lumbar myelogram, 68yo F	32	177	65	275	35

Table 73 continued

Mean pre-, intra-, and post-service work and the percentage of pre- and post-service work to total-service work

Specialty	Service	Service description	Cross-specialty work Pre-service	Intra-service	Post-service	Total-service	Percentage pre & post of total work
Anesthesia services							
mx	M	Gen anesth, off extract 4 wisdom teeth healthy 18yo M, etc.	33	147	28	209	30
mx	N	Gen anesth for extract of fx tooth in 4yo child	22	130	35	187	31
mx	F	Gen anesth extract abscessed tooth in healthy 40yo M	30	93	23	146	36
an	R	Inj of anesthetic substance, therapeutic, 1x, epidural block	38	126	41	205	39
an	A	Anesth for CABG w pump oxygenator	118	615	271	1004	39
mx	E	Gen anesth 14yo child, expos 1 impacted cuspid, off setting	33	125	51	209	40
an	P	Anesth for carotid endarterectomy	86	340	150	576	41
an	U	Anesth for cesarean section	68	231	100	399	42
an	E	Anesth for laparoscopic tubal ligation	43	127	51	221	42
an	B	Anesth for cystoscopy	27	73	28	128	43
an	L	Anesth for D&C of uterus	25	65	25	116	44
an	F	Anesth for cholecystectomy	61	201	95	358	44
an	O	Anesth for transurethral resection of prostate	57	173	83	312	45
an	T	Anesth for craniectomy or craniotomy	113	435	250	798	46
an	K	Anesth for rep of AAA	125	509	323	957	47
an	M	Anesth for lens surgery, cataract extraction, etc	54	147	77	278	47
an	J	Anesth for open reduction and int fixation hip fx	81	232	134	447	48
an	C	Anesth for colectomy	91	256	150	497	49
an	G	Anesth for total hip replmnt	100	292	197	589	50
an	S	Anesth for modified radical mastectomy	67	176	114	358	51
an	D	Anesth for femoral-popliteal bypass	103	299	207	609	51
gs	C	Regional IV anesth, upper extremity op, surg by other	38	79	50	167	53
an	Q	Regional IV anesth for upper extremity op	49	101	65	215	53
an	I	Anesth for knee arthroscopy	55	105	79	239	56
an	*	Anesth for inguinal hernia rep	51	96	74	220	57

Table 73 continued

Mean pre-, intra-, and post-service work and the percentage of pre- and post-service work to total-service work

Specialty	Service	Service description	Cross-specialty work: Pre-service	Intra-service	Post-service	Total-service	Percentage pre & post of total work
Laboratory services[1]							
ai	H	Interp of pulm function tsts, interp results, FVC, FEV, FEF	0	37	0	37	0
ai	Q	Interp of serum immunoelectrophoresis	0	28	0	28	0
dm	D	Obtain specimen Tzanck Smear and interp of tst	0	33	0	33	0
dm	H	Obtain specimen for KOH slide and interp of tst	0	23	0	23	0
fp	I	Urinalysis w micro exam, off lab, supervs, excl collection	0	15	0	15	0
fp	J	Obtain specimen for KOH slide and interp of tst	0	23	0	23	0
im	E	Urinalysis w micro exam, off lab, supervs, excl collection	0	15	0	15	0
im	U	ECG w interp in a 50yo M	0	28	0	28	0
ob	T	Interp of fetal non stress tst	0	41	0	41	0
op	R	Endothelial cell count pre-op cataract surg	0	54	0	54	0
ot	J	Interp of audiometry, basic, comp	0	31	0	31	0
ot	K	Interp of spontaneous nystagmus tst, w recording (ENG)	0	47	0	47	0
pe	Q	Urinalysis w micro exam, off lab, excl collection	0	18	0	18	0
rh	F	Perf & interp cell count, differential, etc., synovial fluid	0	42	0	42	0
rh	P	Interp of sed rate, (ESR) Westergren type	0	12	0	12	0
rh	R	Interp of platelet count, Coulter counter	0	10	0	10	0
ur	R	Semen analysis for infertility	0	44	0	44	0
pa	F	Interp of serum immunoelectrophoresis	...	28	...	40	30
pa	H	Interp peripheral blood smear showing atypical lymphocytes	...	31	...	44	31
pa	P	Interp of L/S ratio for fetal maturity	...	26	...	38	32
Pathology services[1]							
dm	S	Path gross and micro exam, melanocytic lesion, 26yo F	0	66	0	66	0
pa	E	Exam acid fast stained slide, etc., lesion of lymph node	...	53	...	65	18
pa	G	Cytologic exam of a bronchial aspirate	...	59	...	76	23
pa	J	Interp of fine needle aspirate of the prostate, 10 smears	...	95	...	127	25
pa	*	Exam of a gall bladder removed for cholelithiasis	...	18	...	25	26
pa	L	Exam mult endoscopically remov biopsies, etc., pt w colitis	...	66	...	90	26

Table 73 continued

Mean pre-, intra-, and post-service work and the percentage of pre- and post-service work to total-service work

			Cross-specialty work				Percentag pre & pos of tota work
Specialty	Service	Service description	Pre-service	Intra-service	Post-service	Total-service	
pa	A	Exam of a tot laryngectomy etc., CA of larynx, etc.	...	195	...	265	27
pa	M	Exam hysterectomy and salpingo-oophorectomy, 57yo F, etc.	...	94	...	128	27
pa	I	Exam posterior cervical lymph node biopsy, 46yo M, etc.	...	94	...	128	27
pa	B	Exam two segments vas deferentia, etc., to induce sterility	...	9	...	12	28
pa	O	Exam of a changing melanocytic lesion in a 26yo F	...	90	...	126	29
pa	Q	Exam of D&C for bleeding in a postmenopausal F	...	51	...	75	32
pa	R	Clinical path consult, ltd-crystal analysis synovial fluid	...	26	...	39	33
pa	C	Exam frozen section breast biopsy, 2-3 cm, 34yo F, etc.	...	97	...	149	35

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[1] Pathology pre- and post-service work calculations are described in text.

Table 75

Frequency of the ratio of pre- and post-work to total-service work for major service classes

	Percentage of pre- and post-service work to total-service work										
Service class	<10	10 to <20	20 to <30	30 to <40	40 to <50	50 to <60	60 to <70	70 to <80	80 to <90	>=90	Total
Evaluation/management (all settings)	-	8	36	103	15	1	-	-	-	-	163
Imaging	15	-	12	10	-	-	-	-	-	-	37
Anesthesia	-	-	1	4	13	7	-	-	-	-	25
Invasive, office setting	-	1	1	20	19	1	-	-	-	-	42
Invasive, surgical center setting	-	-	5	4	5	4	5	-	-	-	23
Invasive, hospital inpatient setting	1	2	1	18	38	16	4	-	-	-	80
Total	16	11	56	159	90	29	9	-	-	-	370

Table 74

Means of pre-, intra-, and post-service work by major service class

Service class	Mean cross-specialty work			Average percentage pre & post to total work
	Pre-service	Intra-service	Post-service	
Evaluation and management (all settings)	19	104	38	34
Imaging	9	78	17	29
Anesthesia	63	207	108	47
Invasive, office setting	25	91	27	39
Invasive, surgical center setting	122	348	94	44
Invasive, hospital inpatient setting	139	728	407	46

Chapter 8

Extrapolation

8.1 Objectives

The national survey of physicians provided extensive data on the total work associated with some 372 distinct services. These are but a fraction -- albeit an important one -- of the total number of services that are performed by physicians. According to HCFA's Common Procedure Coding System (HCPCS), there are about 6,000 definable services relevant to the specialties covered by this study. To obtain and analyze information for many thousands of services in the same manner that has been used for the several hundred in the sample is not only impractical, it would not be cost-effective. If the RBRVS is to be used as the basis for physician payment, however, some method must be devised to extend what has been learned about the 372 services to at least some part of that larger universe. How, then, can we extrapolate from our surveyed services to the universe? On what basis do we assign total work values to the thousands of unsurveyed services?

This chapter describes the methods we have developed for extrapolating the survey information to create measures of total work for unsurveyed services. The next section presents some data that provide perspective on the scope of the extrapolation task. Section 8.4 is a discussion of the methodology we developed for the extrapolation. Section 8.5 describes the data sources employed in addition to our survey information. In the two concluding sections, we present and assess our results.

8.2 Scope of the Extrapolation Study

While there are about 6,000 defined services that are relevant to the included specialties, not all of them are performed with equal frequency. The frequency with which services are performed is, in fact, highly skewed. According to Medicare Part B data, for example, only four HCPCS codes account for 12 percent of services rendered (for our included specialties) in the evaluation and management category. Twenty-five out of some 4,000 coded surgical procedures account for about one third of total surgical claims to commercial insurance companies. Conversely, for each of more than 2,000 HCPCS codes, less than 200 claims were submitted to Medicare during all of 1986.

This skewness is in part a function of the uneven distribution of physicians' workloads, which in turn reflects the nonuniform distribution of disease among the population. It is also a function of the level of detail used to define services within HCPCS. For example, one of the HCPCS psychiatric services is "psychological testing by physician, with written report, per hour" -- a very broad category. In contrast, six codes have been defined within the HCPCS category "Excision, benign lesions," which distinguish among the lesions according to their exact size in centimeters. One might expect the broad service code to account for a relatively high proportion of psychiatrists' services, and the more specific one (say, excision of benign lesions from 0.6 to 1.0 centimeter) to account for a relatively small proportion of dermatologists' services, simply as a result of the level of detail incorporated in the coding scheme.

In selecting our sample of services to be rated in the national survey, we took into account both the frequency and dollar volume associated with the procedures within each of the included specialties, although, as discussed in Chapter 3, such numbers were not the sole criteria used to select the sample. Table 76 presents the distribution of our surveyed procedures across the four categories as well as the estimated proportions of Medicare Part B dollars accounted for by each set of surveyed services within all but three of the included specialties: anesthesiology, pediatrics, and oral and maxillofacial surgery. These three specialties were excluded due to limitations in Medicare coverage or data.

The total number of surveyed services shown in Table 76 is smaller than the grand total of 372, for several reasons. First, it excludes anesthesia procedures. Second, it excludes all services for which there is no HCPCS code (e.g., several of the obstetrical services) as well as vignettes in the invasive, imaging, and laboratory categories that were assigned the same HCPCS code. Within the evaluation and management category, we have allowed for variation by specialty within a given code. Finally, the table excludes all codes for which charge data were not available.

As shown in Table 76, our numerically small samples of services account for disproportionately large shares of total dollars within each of their respective categories. The sample accounts for 34 percent of total expenditures for imaging services, 38 percent of the dollars for invasive procedures, 40 percent of the outlays for laboratory procedures, and 48 percent of the total for evaluation and management services. Overall, our sample, which includes less than 4 percent of relevant HCPCS codes, accounts for more than 40 percent of the associated Medicare charges.

Because of the considerable overlap among specialties,the proportions of charges covered by our study will appear to be low because we have deliberately excluded from our sample those services that are performed most often by one of the omitted specialties. For example, there is some overlap among the services performed by internists, family doctors, and gastroenterologists. The first two specialties are included in this study, and the third is not. Consequently, services that are performed commonly by gastroenterologists, but which may also be performed by internists and family doctors, were not included in our survey. Some of the major specialties that have not been included in our study are neurology, neurosurgery, cardiology, therapeutic radiology, and nuclear medicine.

Although anesthesiology is among the 18 specialties included in our study, we will propose to employ a separate method for extrapolating data for that specialty. That methodology is built on one designed by the American Society of Anesthesiologists, which uses time and complexity measures. In this chapter, we focus only on the remaining specialties, for which we have had to develop a new method.

The proportions covered by our sample, in summary, reflect the selection of included specialties, the number of defined services within each category, the distribution of total dollars among those procedures, and the selection of surveyed services. The data shown in Table 76 indicate the extent of the extrapolation task.

8.3 Assignment of CPT-4 Codes to Service Descriptions

Total work values were derived by summing the pre-, post-, and intra-work values for a series of service descriptions, or vignettes. We then had to assign appropriate CPT-4 codes to each of these vignettes prior to performing the extrapolation. We solicited the assistance of our TCG physicians, as well as the AMA's staff experts on CPT-4, in making the code assignments to ensure that they corresponded to current coding convention. The codes assigned to each of the service descriptions are presented in Appendix O, Table O.1.

For most of the service descriptions, code assignments were relatively straightforward and mutually exclusive. Consequently, for those codes, total work values were taken directly from study data, given the one-to-one correspondence between the service description and the assigned CPT-4 code.

For the remaining vignettes, code assignments were not mutually exclusive, and we had to develop a method for combining the multiple observations into a single work value for each of the codes involved. We had multiple observations for a single CPT-4 code for two reasons. First, because of the breadth and ambiguity of the service definitions for evaluation and management codes in CPT-4, we often found that more than one vignette within a given specialty was assigned the same CPT-4 code. The associated study values for total work were always similar in these instances, but not identical. Consequently, we took a straight, arithmetic average of the total work values for all vignettes assigned the same CPT-4 code within a specialty and produced a composite total work measure for that code. The process can be followed in detail using the data provided in Appendix O, Table O.2.

The second category of vignettes which were assigned duplicate CPT-4 codes were the so-called "same" services that were proposed as links among the specialties during the cross-specialty alignment. As discussed in Chapter 6, we used as many of these as the actual links as possible, provided both physician judgment and the empirical evidence from the survey indicated that the services described in the vignettes were performed in the same way by different specialties. Some of the links that had been proposed, however, were ultimately rejected. For both the accepted and rejected links, we again had to develop a method for producing a single total work value for each individual CPT-4 code.

Even when the proposed links were accepted as valid, the study-derived work ratings were not exactly the same across specialties after we aligned the ratings of work from different specialties on a common scale. These differences arose because our cross-specialty linkage process could not align the values perfectly across all links. Therefore, we expected to find some disagreement, and nearly all of the resulting differences in total work were less than 20 percent. In order to produce a single total work value for each CPT-4 code, we weighted the mean ratings given by each specialty according to the frequency with which that service was billed to Medicare Part B by the respective specialty. (For a few pairs of services, Medicare data could not be used to develop weights, and some other basis had to be used.) Appendix O, Table O.3 arrays the weights used to form the composite total work values for these linking services.

Finally, we had to produce single values of total work for the CPT-4 codes assigned to links that were proposed but ultimately rejected. These services were not used as links in large part because the ratings for the same service description varied substantially -- that is, by more than 20 percent -- across different specialties. We resolved these discrepancies on a case-by-case basis. The specific steps taken are described in Appendix P.

There were 409 services included in the survey of work for the resource-based relative value study. Two of these services were deleted from the data analysis, which left 407 services remaining.[1]

As discussed in Chapter 6, the cross-specialty linkage process identified 35 services that were considered to be the "same." These services had identical wording of the vignettes. These "same" services were combined into one service with the same work values. This left 372 unique services in the data set, which were mapped into the CPT-4 codes. Table 77 provides the detailed explanation of the steps.

8.4 Methodology

In this section we discuss the method we have developed to extrapolate the study data. The full discussion is subdivided into four parts. The first describes the conceptual basis for our approach and outlines the key assumptions that we have employed. The second concerns the definition of the units within which the actual extrapolation takes place, the third describes the method itself, and the fourth provides empirical evidence about the validity of the extrapolation methods.

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[1] The two services which were deleted from the data analysis were:

- Pathology D - Flow cytometric DNA analysis; deleted due to insufficient data because this is a newly emerging procedure. (Many pathologists did not feel knowledgeable enough to give a rating.)
- Radiology U - Interpretation of pulmonary perfusion studies for question of pulmonary embolization; deleted due to incorrect wording of vignette, according to a TCG panelist.

8.4.1 Assumptions

An RBRVS is intended to capture as precisely as possible the resource inputs associated with physicians' services. Our research has revealed that physicians' total work for a given service is a function of both the time and the intensity spent in performing it. These findings indicate that the ideal extrapolation method would employ sources of data on time and intensity by individual service to develop the extrapolated values. If we had such data, we could design a regression model that would yield coefficients for time and intensity from the survey data and use them in combination with the additional time and intensity data for the remaining, unsurveyed services to produce the extrapolated values of total work.

Investigation of available data sources, however, revealed that there are no data on intensity levels and no adequate sources of information on time. While some information on procedure times are available from individual providers, particularly from operating room records maintained by hospitals, they are limited in scope and not necessarily generalizable. Another problem associated with using these sources of time data is that the procedures are commonly coded using the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM), a coding system that is also in widespread use but which is fundamentally incompatible with HCPCS.

In the end, availability of data became a binding constraint in this extrapolation study. The only surrogate for resource inputs that we could obtain by individual service was charges. However, we have made the argument -- indeed, it is one of the motivations for this study -- that charges are very poor measures of resource inputs, due to significant market imperfections. For example, physicians' fees are likely to be distorted by the unevenness of insurance coverage; the customary, prevailing, and reasonable (CPR) payment method; consumer ignorance; and so forth. How, then, can we justify using charges as the basis for extrapolation?

Our justification is simple. We have attempted to develop a method of using the information contained in the charge data without automatically building the inherent distortions into the RBRVS. We have done this by narrowly confining our use of the charge data.

The cornerstone of our methodology is the assumption that charges can be used as measures of relative work within small, relatively homogeneous groups -- or families -- of services. We have assumed that within such families the imperfections of the market have acted similarly upon each of the member services. For example, within the families, the effects of insurance coverage as well as consumer ignorance should be about the same on each component service. Consequently, the charges for the individual services within each of the families should represent reasonable surrogates for the total work involved in performing the service.

Using this framework, we would assume that charges are a reasonable basis for estimating the differences in total work among, for example, three- and four-artery coronary artery bypass grafts (CABGs). We would not assume, however, that charges should be used to distinguish the total work involved in performing a CABG versus an office visit.

This approach also has a certain intuitive appeal. Having direct information about the work involved for one service should provide information about the work required for other, related services. For example, if we have direct information from the study on the total work involved in performing a three-artery CABG, we should be able to make reasonable inferences about the relative work associated with two- and four-artery CABGs using existing information. Even if the result does not necessarily replicate what would be obtained if comparable survey data were available for the unsurveyed services, we would argue that the result will be closer to that ideal than current charges without modification.

We asked the members of our Technical Consulting Groups (TCGs) to assess the reasonableness of our assumptions as well as some of the data for their respective specialties. Specifically, we presented data on relative charges for unsurveyed services included in the relevant families of the surveyed services. We then asked the physicians to evaluate whether the relative charges within the families seemed to reflect accurately the differences in work inputs. The TCG members observed that the relative charges within the families of each surveyed service generally seemed to reflect the differences in work among component services.

8.4.2 Defining the Hierarchy of Services

The definition of the families of services grew out of our own research, coupled with an existing classification scheme. Within each of the specialties selected for study, we categorized services within a hierarchy, using four broad categories described earlier: evaluation and management, invasive, imaging, and laboratory. Each category requires somewhat different combinations of work inputs, that is, time, mental effort, technical skill, stress, and risk. We then searched for ways to distinguish homogeneous groups within each of the four categories.

Initially, we proposed to use a statistical approach to defining these groups. That method employed cluster analysis to identify groups of procedures with similar charges within each of the individual specialties. The assumption underlying this approach was that similar charges within specialties implied similar resource inputs. This assumption was not supported by our TCGs, and some additional empirical analysis provided further evidence that this approach was inferior to the alternative that we ultimately selected.

That alternative made use of the HCPCS coding scheme itself. The portion of HCPCS that is relevant to our included specialties is derived from Physicians' Current Procedural

Terminology, Fourth Edition (CPT-4). The hierarchical structure within HCPCS/CPT-4 represents a logical basis for partitioning the categories into relatively homogeneous groups of services. The TCGs as well as our own medical staff reviewed these partitions and agreed that they would serve as a valid basis for subdividing the relevant universe.

HCPCS nomenclature incorporates a hierarchical classification scheme that partitions the 6,000 relevant codes into progressively smaller and more homogeneous categories. The initial partition is a four-group classification (again, excluding anesthesia procedures): Medicine, Surgery, Radiology, and Pathology. These labels correspond closely to the category designations we have used (evaluation and management, invasive, imaging, and laboratory), though some reclassifications were necessary. The methods used to further subdivide the services within each of these four broad categories vary by category.

Within the evaluation and management category, we first partitioned by the setting in which the service is performed (such as office versus hospital), then by the type of service (such as consultation versus care) and category of patient (new versus established). Evaluation and management services are also defined specifically for certain specialties, such as psychiatry and ophthalmology.

For invasive procedures, which incorporate the largest number of codes for the four categories of physicians' services, we partitioned first according to body system, and then according to anatomic region and type of procedure, as shown in Figure 6. For example, digestive system procedures are distinguished from procedures performed on the urinary, auditory, and other body systems. Within the group of digestive system procedures, to continue the example, further distinctions are made according to the specific organ or anatomic region of the body (e.g., esophagus, liver). Still further distinctions are then made by type of procedure. For example, endoscopies of the esophagus are distinguished from incision, excision, repair, suture, and manipulation procedures. Parallel processes were used to classify services for the remaining body systems.

Body system and anatomic region were used first to classify imaging procedures. Then the types of procedures were distinguished. For example, within the specialty of diagnostic radiology, head and neck procedures were distinguished from those for the abdomen and vascular system. We also made further distinctions by type of procedure (i.e., conventional x-rays, computerized axial tomography, and magnetic resonance imaging), although these are not explicitly made in HCPCS.

Finally, type of procedure was the exclusive basis for classifying laboratory procedures. HCPCS-defined families of laboratory procedures include, for example, "chemistry and toxicology," "microbiology," and "surgical pathology."

In summary, we used a multi-step process to disaggregate the universe of some 6,000 coded services into relatively homogeneous families. We began by subdividing the relevant universe for each specialty into the four broad categories of procedures: evaluation and management, invasive, imaging, and laboratory. The next steps further subdivided the procedures by setting, body systems, anatomic region, type of procedure, and so on. The result of this process is a set of families that each contain relatively similar types of procedures, based largely on the criteria employed in the HCPCS system of nomenclature.

Typically, even within these relatively homogeneous families, some of the procedures were more closely related to each other than to others in the family. For example, one of our surveyed procedures was the coronary artery bypass, autogenous graft, three coronary grafts (i.e., a three-vessel CABG). This procedure is contained within the family of "Coronary Artery Procedures," which contains 12 coded procedures. Among these, five are closely related to the three-vessel CABG, namely, the one-, two-, four-, five-, and six-vessel CABGs. We regarded this first set of procedures as a "nuclear family," that is, as a set of procedures that were variants of the same basic procedure.

The remaining procedures in this family include anomalous coronary artery ligations and grafts, and nonautogenous grafts. We regarded this second set of procedures as part of the "extended family." As it contains other coronary artery procedures as well as CABGs, the extended family is still a homogeneous entity within the universe of invasive procedures. However, the extended family is somewhat more diverse than the nuclear family. Many of the extended families defined by HCPCS are comprised of several even more homogeneous nuclear families.

8.4.3 Using the Families for Extrapolation

We then linked the surveyed services to their relevant families, according to their HCPCS codes. Though not all of the HCPCS-defined families contained a surveyed service, many included at least one. When a HCPCS family contained more than one surveyed service, we subdivided the family into as many smaller families as there were surveyed services, so that each surveyed service would be part of a unique, and mutually exclusive, family. Whenever such a subdivision was made, we attempted always to group the most clinically similar services and procedures together.

Initially, we proposed to employ the more conservative nuclear family as the basis for extrapolation. However, based on further consideration by our physician investigators, coupled with the advice from our TCGs, we concluded that it would be valid to extend our methodology to the full extended families, as defined by HCPCS.

Within each family, we labeled the surveyed service the "benchmark" within its family. This benchmark served as the standard for computing relative values of total work for other services within the family. First, we calculated the ratio between the mean charge for each unsurveyed service and that for the benchmark. The rating of total work for the benchmark was then multiplied by the respective ratios to produce the extrapolated values.

For three of the four categories of service -- invasive, imaging, and laboratory -- our extrapolations were made to the families of services without regard to specialty. In doing this, we assumed that work values should not vary significantly by specialty, although in constructing the final RBRVS, we do make specialty-specific adjustments for training and practice costs. Consequently, the vast majority of our extrapolated work values are intended to apply to any specialty performing the service. (In practice, most services within these three categories are performed by only a few specialties.)

We could not make the same assumption for the evaluation and management services. These services tend to be more broadly defined than those in the other three categories, allowing for wide and systematic variation in patient severity and practice patterns by specialty. For example, the amount of time required for a comprehensive office visits, new patient, averaged more than 50 percent longer for a rheumatologist than for a family doctor. The individual evaluation and management services are also performed by a wider array of specialists than the individual invasive, imaging, and laboratory services. Consequently, we developed specialty-specific work values for the evaluation and management services, which were further distinguished by the specialty-specific adjustments for training and practice costs.

In addition to the 6,000 defined codes that apply to the specialties we studied, the HCPCS system provides for the use of supplementary codes that modify the basic service. For example, one modifier indicates that a given procedure involved a greater amount of service than is usually required; another identifies the professional component of the global charge. Many of the modifiers are not specific and, consequently, could not be assigned a single RBRVS value. In practice, most modifiers are used relatively infrequently. The most frequently used modifiers identify the professional component of radiology procedures.

For the extrapolation, we dealt with modified HCPCS codes in two ways. First, when a benchmark service was assigned a modified code, we produced an extrapolated value for all other codes using that same modifier as well as all of the unmodified codes in the relevant family. Second, many of the surveyed services in radiology applied to the professional component of the service only, in keeping with our strategy of focusing on physician input. Consequently, most of our extrapolated values in the imaging category apply to the professional component of the services only.

8.4.4 Empirical Assessment of the Methodology

We used regression analysis and the study data to investigate the correspondence between mean charges and work, and, consequently, to evaluate the validity of our extrapolation method. Because there were multiple observations for many of the evaluation and management HCPCS codes, reflecting different specialties' values, we used the data for internal medicine to represent this category. First, mean charges were used to explain the overall variation in work. Both variables were transformed to common logs. This transformation produced regression residuals which were normally distributed and homoscedastic. The resulting R^2 was 0.86, indicating that after both variables are transformed to logarithms, charges alone explain a high proportion of the variation in work across the spectrum of services rendered by physicians.

However, analysis of the residuals from that regression -- the difference between actual values of work and those predicted by charges -- revealed that there were systematic differences in the unexplained variation. The mean percentage deviations from the mean work value by category of service ranged from -16 percent for imaging services to +23 percent for evaluation and management services. Also, as we show later in Chapter 12, the ratio of charges to work varies greatly across categories of services. These results suggested that disaggregating the services into smaller and more homogeneous groups, as we do for the extrapolation, will increase the overall explanatory power of the regression model.

We then added a set of sixteen dummy variables measuring the family groupings similar to those used in the actual extrapolation and measured that increase. Because, by design, there is only one surveyed service per family, we could not replicate the actual families, but we constructed them to resemble the actual families as closely as possible subject to sample size constraints. For example, we defined a dummy variable containing all invasive procedures on the digestive system that were included in the survey. In the extrapolation methodology, each of these digestive system procedures would be part of a separate, smaller, and still more homogeneous family, such as biliary tract excision procedures. Consequently, our results are low estimates of how well charges predict work within the families.

The dummy variables along with mean charges were used in a regression to predict work values. Addition of the dummy variables increased the overall explanatory power of the model from 86 percent to 93 percent. We calculated an F-ratio measuring the relative reduction in the error sum of squares from this regression relative to the regression using charges alone. The calculated ratio was 11.78, a highly statistically significant result ($p < .01$). This result confirms that disaggregating the services into more homogeneous groups significantly enhances the power of charges alone to predict work. Results from both regressions are presented on Table 78.

We inferred from the regression analyses that having data on total work for a given service in a family would enable us to predict with reasonable accuracy, using charges, the values of total work for other services in the same family. Overall, the regression results strongly supported the validity of our approach to extrapolating the study data.

8.4.5 Extrapolation of Evaluation and Management Services

The extrapolation methodology may not be the best one to apply to the system of coding for evaluation and management services. We discovered that: (1) there is considerable ambiguity in the description of the services covered by evaluation and management codes; (2) there appear to be large variations in coding/billing practices between specialties; and (3) limitations in the accuracy of the charge database currently available. These three problems have proven to be so severe that we have not been able to extrapolate successfully to non-surveyed services on a specialty-specific basis.

Given the large differences between specialties in RBRVs for the same evaluation and management service codes, we have explored the possibility of developing specialty-specific RBRVs for evaluation and management service codes. In attempting to develop specialty-specific RBRVs, however, we were confronted by several problems. First, our data base of surveyed evaluation and management services in each specialty is limited, with as few as two in ophthalmology and oral/maxillofacial surgery, three in otolaryngology, four in thoracic/cardiovascular surgery, and five in orthopedics and urology. Second, we do not have a reliable base of specialty-specific charge data for extrapolation to unsurveyed codes. Claim data on a specialty-specific basis are limited for many of these codes. Some specialties do not use all the codes. Further, charges in some specialties may not reflect differences in physicians' work input. In allergy/immunology, for example, charges for office visit codes may reflect a significant factor for inputs by ancillary personnel who perform tests or administer treatment.

In attempts to extrapolate to unsurveyed evaluation and management services codes (not shown), we have found the following anomalies:

1. High extrapolated values for brief, limited, and intermediate services for new patients in the following specialties (allergy and immunology, general surgery, otolaryngology, pediatrics, rheumatology, thoracic surgery, urology, and obstetrics and gynecology) and for this series of office services in established patients for oral/maxillofacial surgery.

2. Extrapolation from surveyed services produced values for comprehensive office services in family practice, internal medicine, pediatrics, and oral/maxillofacial surgery that were lower for new patients than for established patients. This could have resulted either from shortcomings in mapping of surveyed vignettes to codes, the extrapolation process, or both.

3. Extrapolated RBRVs were lower for four out of five codes for new patient office services for Internal medicine than for Family practice. This is in conflict with the experience of Technical Consulting Group panelists and with published data on times for office services for these specialties.

The major difficulty in establishing RBRVs for evaluation and management services stems not from measuring the work of these services but in interpreting the CPT-4 codes. We have seen that, because of the ambiguty in the description of services, the codes appear to be understood very differently by different specialties. Further, there may be major variations in how they are interpreted within specialties. Differences in interpretation of these codes seem to follow from the ambiguity with which they are defined, difficulty in applying the definitions successfully for different specialties, and the lack of a uniform standard of assigning codes. These difficulties have been noted by other observers, including those of the Physician Payment Review Commission. Under these circumstances, we are not confident to attach RBRVs to these codes that would be applicable to different specialties. Limitations of surveyed data and of an adequate data base on charges precludes development of specialty-specific RBRVs.

Nevertheless, our data suggest another approach. Physicians are in close agreement in their ratings of work and time for a large number of evaluation and management services services. We have found that the ratio of these ratings of work (on the common scale) and time vary within a relatively narrow range.

Ratings of work for evaluation and management services, imaging, and laboratory services follow a closer relationship to time than do those of invasive services. Ratings of work per minute of evaluation and management services cluster quite closely around a mean of 3.2, with a standard deviation of 0.7

and a range of 1.6 to 6.1 units of work per minute. In contrast, the mean work per unit time (W/T) for invasive procedures was 7.1 with greater variance (S.D. 3.3) and range (1.9 to 19.4). Our results suggest that the mean work per minute by site and function of evaluation and management services differs minimally. Other than telephone services and post-operative hospital services, which show higher average ratings of work per minute than do office, consultative, and nursing home services, the mean values for all other types are within one standard deviation of the mean (0.6) for office services. Importantly, for each type of service the range of W/T across specialties is modest.

This suggests that clearer definitions of codes for evaluation and management services, with specification of time, would permit the development of RBRVs designed to provide equitable reimbursement. The Physician Payment Review Commission stated in its second annual report that: "To account for differences in work by specialty for visits and consultations, definitions of existing codes could be improved and their use standardized, or a new set of codes might be developed..." We propose to explore one or more new extrapolation methods for evaluation and management services.

For instance, we will perform regression analysis that would predict total work as a function of intra-service time (the time most clearly measured) for evaluation and management services services. We would perform individual analyses for medical specialties and for surgical specialties. If data on enough services are available, analyses would be performed to distinguish office, hospital, surgical center, emergency, and nursing home services.

The results of these analyses would be curves showing total work as a function of time for evaluation and management services for important classes of services and types of specialties. Application of the appropriate factors for practice costs and the opportunity cost of training would allow these curves to be translated into RBRVs as a function of time for each specialty for evaluation and management services. Although time is not a part of the current definitions of CPT-4 codes for evaluation and management services, specification of time would allow assignment of RBRVs to codes that would be a more fair reflection of work than is possible under the current system of usage.

8.4.6 Extrapolation of Anesthesia Procedures

As noted earlier, we did not use the extrapolation methodology described in this section for anesthesia procedures. Anesthesia procedures are unique in that they are always rendered in combination with another service. Usually, the two services -- the anesthesia and an invasive procedure -- are performed by two physicians, one an anesthesiologist, the other a surgeon. (On occasion, as for oral surgery procedures, the surgeon also administers the anesthesia.) Typically, therefore, the length of time the anesthesiologists' services are required for any given procedure depends upon the patient's condition and upon the time needed by the surgeon. Consequently, one of the key elements of anesthesiologists' work input is not under the direct control of the anesthesiologist.

In 1985, the American Society of Anesthesiologists (ASA) has constructed a relative value scale for anesthesia procedures, which has subsequently been updated (ASA, 1987). The ASA relative value scale is designed to consist of three components: a basic value, time units, and a physical status modifier. (Under certain circumstances, other modifiers may be added.) The basic value, developed for most anesthesia procedures, represents the value for the "usual" services associated with providing the anesthesia except the time and the modifying factors. Specifically, this basic value is intended to incorporate "usual pre-operative and post-operative visits, the administration of fluids and/or blood incident to the anesthesia care and usual monitoring procedures" (ASA, 1987). Basic values that have been developed for the CPT-4-coded anesthesia procedures range from 1 (for an artificial puncture, for example) to 30 (for a liver transplant procedure).

Time units reflect the amount of time required to perform the anesthesia service. Anesthesia time is defined to begin when the anesthesiologist begins to prepare the patient for anesthesia and to end when the patient may safely be placed under post-operative supervision. Relative to the other components of the

ASA relative value scale, time is intended to dominate.

Finally, physical status modifiers, which range in value from 0 to 3, are designed to capture the relative severity of the patient's condition and the resulting complexity of the anesthesia service. A value of 0 is assigned, for example, to a normal healthy patient, while a value of 3 applies to a "moribund patient who is not expected to survive without the operation" (ASA, 1987).

The ASA relative value scale is constructed from an additive model, where, for each coded service, the basic value is added to the time units, to which is then added the appropriate physical status modifier. For some procedures, such as anesthesia provided in conjunction with pulmonary function testing or certain diagnostic or therapeutic services, the basic value may be the only component of the relative value. For most surgical procedures, all three components may be applicable.

Given the evidence that time is a key element of anesthesia services, and one which usually is not under the direct control of the anesthesiologist, as well as the existence of a systematic attempt by the ASA to identify the relative values of anesthesia services, we elected to explore the comparability of the ASA approach with our study-derived work values. We compared our total work measures with the series of relative values that would be constructed using the ASA method. To construct the ASA relative values, we employed the same standard procedure used in the national survey and used the mean times reported in the survey for each procedure, adding them to the appropriate basic values. Total work proved to be highly correlated with the ASA scale (r=.96), supporting the validity of the ASA approach.

Even if it were appropriate to do, we could not actually use the ASA method to extrapolate our study data. Given the evidence that surgeons, rather than anesthesiologists, determine the total time required for a particular surgical procedure, it can be argued that the relative value units for each anesthesia service performed should reflect the predetermined basic value plus the actual time involved (plus any appropriate modifiers). It could also be argued, however, that averaging surgical times to construct a set of procedure-specific relative values for anesthesia is appropriate as well as consistent with the concept underlying the RBRVS for the remaining specialties. However, we could not extrapolate our study data further, as we lacked time data that were reliable, nationally representative, and also coded in CPT-4 anesthesia codes.

8.5 Sources of Data on Charges

The most important source of charge data by HCPCS-coded service for this study was the Medicare Part B Procedure File. This file contains submitted charges for virtually all services billed to Medicare during 1986. The portion of the Medicare file that was relevant for this study incorporates data for about 400 million claims, amounting to more than $21 billion in total charges.

A second source that we used to supplement the Medicare data was the surgical charge file compiled by the Health Insurance Association of America (HIAA). The HIAA tapes contain detailed data on the surgical charges submitted to 90 companies throughout the nation from March 1986 through February 1987. The contributors to this data file are primarily commercial insurance companies, but they also include some Blue Cross-Blue Shield plans, companies that self-insure and administer their own claims, and third-party claims administrators. Unlike the Medicare data, which are comprehensive in their coverage, the HIAA file includes data only for surgical procedures. It incorporates about 14 million surgical claims for patients of all ages, amounting to nearly $6 billion in billed charges.

The two files are to some extent complementary, in that the Medicare data provide extensive information on services performed on the elderly while the HIAA data apply primarily to the under-65 population. Further, by pooling the two data sets, we increased the number of procedures for which can could produce extrapolated values. They are highly correlated (r=0.87) for the services the two files had in common, so the extrapolated results should not be highly sensitive to the data source(s) employed.

Even with the large volume of data available from Medicare and HIAA, there were three specialties for which we had insufficient charge information. Rheumatology is not identified separately in the Medicare files. When we extrapolated the study data within that specialty, therefore, we used as a basis the charges for internal medicine, of which rheumatology is a subspecialty.

The remaining two specialties for which we lacked sufficient charge data were pediatrics and oral and maxillofacial surgery. For pediatrics, claims volume was very low across the full spectrum of services, reflecting the very limited Medicare coverage for pediatric care. For oral and maxillofacial surgery, the data were most deficient for tooth extractions, an important service for oral surgeons but one for which Medicare coverage also is limited.

We obtained supplementary charge information for both pediatrics and oral and maxillofacial surgery, so that we could produce extrapolated values within those specialties. Data for 1987 on pediatric claims and associated charges were provided by two insurance companies, the Prudential Insurance Company of America and the Metropolitan Life Insurance Company, whose cooperation we gratefully acknowledge. Unpublished survey data from 1985 for selected oral surgery procedures were provided by the American Association of Oral and Maxillofacial Surgeons.

8.6 Results

8.6.1 Extrapolation to HCPCS-Defined Families

When the survey values are extrapolated to the unsurveyed services within the relevant families, the number of services for which we can produce an RBRVS increases dramatically. As shown on Table 79, the proportions of total charges accounted for when the families were included rose to more than 70 percent for three of the four categories and to almost 50 percent for laboratory services.

The low proportion of total charges covered for laboratory services reflects a deliberate sampling strategy within this category. The overwhelming majority of the laboratory codes are tests -- some of which are automated -- that require relatively little input from pathologists. Our sample of laboratory services was clustered in HCPCS families of procedures requiring substantial work input by pathologists, such as surgical pathology consultations. While these procedures in total account for a relatively low percentage of all laboratory charges (which include the tests), they are the most comparable to the services selected for the remaining categories.

Tables 80 and 81 illustrate the mechanics of the extrapolation process and present some results for one of the families of invasive procedures. The family "Biliary Tract, Excision Procedures" serves as an example. This family contains six coded procedures. Of these, cholecystectomy was included in the national survey and, consequently, it is the benchmark procedure. A direct measure of total work for cholecystectomy was derived as part of this study, based primarily on survey data and using the methods described earlier in this report. Table 80 illustrates the initial step in the extrapolation process, which involves the computation of ratios between the mean charges for the benchmark and each of the other services within the family. The charge data that we employed represent a weighted average of the Medicare Part B and HIAA charges.

As shown on the table, the volume-weighted average charge for a cholecystectomy is $1,109. We converted the mean charges for the remaining procedures in the group to ratios between each procedure and the benchmark value, and the result was the set of ratios shown in the far right column of Table 80. The ratios indicate that for cholecystectomies involving additional tasks, such as cholangiography or exploration of the common duct, physicians charged from 7 to 48 percent more than they charged for the straightforward cholecystectomy. We have assumed that the differences in charges reflect the difference in total work input among the various procedures within that family. Accordingly, the two remaining procedures, a stone extraction and bile duct exploration, are assumed to involve about half as much and about the same amount of work as the benchmark cholecystectomy, respectively.

We then used the calculated ratios as the basis for extrapolating the total work value derived for the benchmark procedure as part of this study. The inter-specialty relative value of total work for cholecystectomy was 991, which becomes the benchmark value that is multiplied by the relevant charge-based ratio to produce the extrapolated total work values for the other five unsurveyed procedures in the group. The results of this process are illustrated on Table 81.

In this same manner, our extrapolation method produces total work values for all services in the families containing surveyed services -- about 2,000 in total. To create the RBRVS, these total work values are then adjusted up or down using the specialty-specific indices measuring the opportunity costs of training and practice costs.

By design, the extrapolation methodology will produce a set of total work values that are proportional to charges only within the HCPCS-defined families. Overall, the new scale will have been aligned in a way consistent with shifts in the relative values developed from the survey data and without regard to current charge patterns.

In assessing the results of the extrapolation methodology, it is easiest to think in terms of the families of procedures rather than individual services, since the families are the basic units of extrapolation in our method. Within any given family, the ratios of total work among procedures always remain the same, no matter what the actual benchmark value may be. If Procedure x is twice as expensive as Procedure y within Family A, then that two-to-one relationship between x and y will hold in the extrapolated scale, no matter what the ultimate numerical values for those two procedures happen to be. Significant changes can occur, however, among the families.

To illustrate, let us assume that Procedure x in Family A and Procedure m in Family B are both surveyed procedures. Further, let us assume that Procedure x has a mean charge that is twice as great as that for Procedure m. Finally, suppose that the survey data indicate that Procedure m actually involves the same amount of work as Procedure x. In the RBRVS, Procedures x and m will have the same value for total work, and the extrapolated values for their associated families will be much closer to each other than their original charges were (although the original hierarchy within each family will be maintained).

We conducted a preliminary review of extrapolated values as discussed in Section 8.7. We plan to employ further extensive review, involving more than two dozen physicians, as a final step in the extrapolation process. The need for that review arises out of our concerns about the quality of the input data on charges, as well as our concern that charges may not reasonably reflect work differences among all procedures to which we would hope to extrapolate. With respect to the data issue, we are aware that the Medicare charge data contain some errors, and it is likely that problems will arise because HCPCS codes are not always assigned in an accurate -- or even consistent -- manner around the country. We also anticipate that, because of such coding errors or for other reasons, some of extrapolated values will be viewed as unreasonable.

8.6.2 Sensitivity Analysis

A critically important yet very troublesome aspect of this extrapolation component has been the validation of the methodology. We recognized from the outset the need to demonstrate that our method produced valid extrapolated values, yet we were not able to devise a definitive means of doing so. The family-based method of extrapolating values of total work was selected as the best means of overcoming the identifiable problems inherent in using charges as the basis for extrapolation, given that charges were the only basis available to us. One of the implications of using this approach to the extrapolation, however, was that there would be no objective way of validating the results obtained when it was employed. The principal problem was that we lacked a "gold standard" for the non-surveyed services to which our extrapolated values could be compared.

One method that we considered was to use a split-sample design in which about half of the surveyed services would be used as benchmarks for an extrapolation and the remaining half would serve as the standard against which the extrapolated values could be compared. However, because the study methodology calls for extrapolating within families of services using single benchmarks within each family, no such approach will truly test our extrapolation method because it will not replicate it.

As we have noted, a small proportion of the HCPCS-defined families contained more than one surveyed service. In these instances, our basic methodology calls for subdividing the family into as many smaller entities as there were surveyed services, so that each surveyed service would have its own unique family. However, these families and surveyed services also presented opportunities for a limited assessment of the methodology.

Whenever we had a HCPCS-defined family that contained more than one surveyed service, we could use one of the surveyed services as the benchmark for the entire family, extrapolate the values for the remaining services in the family, and then compare the extrapolated values to the study values for the other surveyed service(s).

We made such comparisons for two families of evaluation and management services and three families of invasive services. The results of this assessment were mixed, but there was a consistent underlying pattern -- one that is an obvious extension of our methodology. For any given set of services, the more closely the values of total work from our study corresponded to mean charges, the closer the extrapolated value for any individual service was to the measured total work value.

We offer several examples to make this point more concrete. We surveyed three procedures within the HCPCS family "Excision Procedures, Corpus Uteri." The comparative data for all three are shown in the following table:

Procedure Description	Study Total Work Value	Mean Charge	Extrapolated Values of Total Work-- From (1)	From (2)	From (3)
(1) Dilation and curettage	301	$413	301	282	271
(2) Total hysterectomy	973	1,427	1,038	973	922
(3) Vaginal hysterectomy w/ plastic repair, colporrhaphy	1,002	1,550	1,129	1,061	1,002

The values in the leftmost column are all taken directly from the study and are thus the "standard" against which the extrapolated values can be compared. The second column presents the mean charge data on which the extrapolated values were based. The remaining three columns indicate what the respective extrapolated values would be, using each of the three procedures as benchmarks.

For this set of procedures, the charge data correspond quite closely with the study total work values. As a result, the extrapolated values do not differ substantially according to which benchmark was used to create them. The maximum difference between any two pairs of extrapolated values is 11 percent; the minimum is 4 percent. Within this HCPCS family, as a consequence, we would conclude that the extrapolation method works quite well to produce values that correspond reasonably closely to those that would have been obtained by direct measurement of total work.

In contrast, the HCPCS family "Transurethral Surgery (Urethra and Bladder)," which contained two surveyed procedures, showed a different, more sensitive, outcome. Both of the procedures involve cystourethroscopy, with fulguration and/or resection of bladder tumors. One involves a small tumor, the other a medium tumor. Mean charges for the medium tumor are 68 percent higher than for the small tumor, while our total work values indicate only a 14 percent difference. Because of this sizeable discrepancy, the two sets of extrapolated values vary considerably -- by nearly 50 percent. For this group of procedures, therefore, the extrapolated values are not such reliable predictors of total work, and this family should be subjected to more extensive review.

Within evaluation and management services, our sensitivity analyses produced varying results and again reinforced the importance of congruence between total work and charges for ensuring the reliability of the extrapolated values.

8.6.3 Extrapolation to Unrelated Services

Our method of extrapolation is applicable to all HCPCS-defined families that contain a surveyed service. In all, about one third of the codes were contained in these families. As shown in Table 79, this group of services accounts for a disproportionately high percentage of total charges within each of the four categories. There remained, however, a large number of services to which we could not extrapolate.

The relative importance in dollar terms of these "unrelated" services varies by category. For evaluation and management and imaging services, only 9 percent and 13 percent, respectively, of total Medicare charges fell into the unrelated families, while at the other extreme, 51 percent of the total outlays for laboratory services were unrelated to surveyed services. (As we have noted, the majority of charges for laboratory services are for tests involving little physician input, which are not a focus of this study.) For the invasive category, 28 percent of the relevant services were in unrelated families.

The approximately 4,000 HCPCS codes that were classified into families unrelated to surveyed procedures could be divided into two major groups. The first group consisted of services that are performed very infrequently. According to Medicare data, about 2,500 HCPCS codes were assigned to Part B claims less than 200 times during all of 1986. For these codes, mean charges vary significantly from year to year, most likely because the pool of physicians billing Medicare for the services varies from year to year and also because miscoding will have a greater effect when volume is low. Because the charge data were so unreliable, we concluded that it would not be appropriate to extend our extrapolation methodology to these services.

The remaining codes unrelated to the survey-based families were for services performed more frequently and for which the charge data were more reliable. Many of these were services associated with two surgical specialties that include a large number of procedures: orthopedic surgery and general surgery. Because the number of services we surveyed in each specialty did not vary according to the size of the universe of services associated with each specialty, the scope of our extrapolation was more limited for these two specialties. We plan to supplement our data for both orthopedic surgery and general surgery as part of the subsequent study.

Many of the codes in the second group are associated not only with our included specialties, but also with specialties that have been excluded from the study. For example, endoscopies of the esophagus represent one of the major unrelated families of procedures within the invasive category. While these are usually performed by gastroenterologists, whose specialty was not included in the current study, esophagoscopies are also performed by specialists in internal medicine, family medicine, and general surgery, all of which were included in this study. Since the follow-up study will collect data for the specialties not included in the current effort, we will be able to extrapolate to many of the families -- such as esophagoscopies -- that are now unrelated to any of the services studied.

Ideally, we should like to be able to extrapolate to all services in the relevant universe. It is apparent, however, that some procedures will have to be left out of the final RBRVS, even after the subsequent study has been completed. The vast majority of these will be rarely performed services for which the input data are judged to be too unreliable to support the extrapolation.

8.7 Review of Extrapolated Values by a Physician Evaluation Committee

The process of developing and validating RBRVs for the 407 services has given us considerable confidence in the accuracy and reasonableness of these values. However, we also used the RBRVs for the surveyed services to extrapolate to approximately 2,000 services enumerated in the CPT-4 system that were not directly surveyed. These RBRVs derived by extrapolation were not completed until summer 1988. We then had to develop a process to subject all the RBRVs to thorough review by practicing physicians. This section describes the first step in this review process, and the results of this review.

Ideally, we would have liked two committees to review the full set of RBRVs. One committee would consist of Technical Consultant Panel (TCP) members, familiar with our approach and knowledgeable about the method of constructing the RBRVS. In addition to identifying problematic RBRVs, their critical review would also serve to highlight the possible sources of the problems. A second committee would be made up of practicing physicians totally unfamiliar with our methods of constructing the RBRVS. Their review would complement that of the TCP members and perhaps highlight other difficulties or problems.

Given our resources and timetable, however, it was not feasible for two separate groups to review the final RBRVs. We therefore empaneled only one committee, the Physician Evaluation Committee (PEC), made up of a combination of TCP physicians and physicians unfamiliar with the RBRVS. The PEC represented specialists from all the specialties covered by the study, except anesthesiology,[1] including multiple representatives of general surgery, thoracic/cardiovascular surgery, orthopedic surgery, and pediatrics.

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[1] Because we are not extrapolating from surveyed services to non-surveyed services in anesthesiology using our standard method, we had no extrapolated RBRVs to review for anesthesiology.

The PEC met twice. Material to be reviewed was distributed at the first meeting; the members were free to review the material at their leisure. The first meeting was designed to familiarize member physicians with the concept and method of this study. We instructed the members how to evaluate the reasonableness of the RBRVs for services in their respective specialties. We began by discussing our definition of reasonableness; throughout our study, reasonableness is determined by answering the question: Do the relative values generally accord with resource inputs to these services, based on the physicians' knowledge of the practice of medicine? For purposes of this evaluation, the quantitative standard we asked the PEC to apply designated as potentially unreasonable any RBRV whose value was not within 20 percent of the value they would assign to it. We defined as clearly unreasonable (outliers) any RBRV judged to be at least 40 percent too high or too low.

We stressed to the PEC members that we did not have the option of changing any of these relative values at this stage of the study. Our only options were to accept or delete a given relative value in our final report. We also made clear that, after they had made their professional assessments, we would meet as a group to discuss the findings of each member. The staff would then review all the RBRVs and decide whether to include each in our final report.

To facilitate examination of the lists of services in each specialty, we divided the evaluation process into several steps.

First, we asked PEC members to examine the rank order of services in their own specialties and note any services that appeared to be ranked incorrectly.

For comparative purposes, we arranged the RBRVs in each specialty into arbitrary groups of services with similar resource-based values. Within these groupings, we asked the PEC physicians to examine the individual RBRVs and evaluate their relationships to other services within the grouping, using two criteria: (1) to identify services for which the relative value seems is 20 percent too low or 20 percent too high relative to the median value shown in the group, and (2) to identify services for which the relative value seems at least 40 percent too high or 40 percent too low (the outliers).

Third, we arranged the groupings of services for each specialty in such a manner that each grouping was incrementally higher than the previous grouping. For example, some groups had RBRVs twice as large as those of the previous group. We asked PEC members to compare the values of each group to other groups to see if these relationships in relative value seemed appropriate.

Next, we asked the physicians to assess the relative value of each service for reasonableness, and to indicate the certainty of their conclusions as follows:

1. I definitely think the relative value is wrong.
2. I tend to think the relative value is wrong.

3. I am not sure.

4. I tend to think the relative value is right.

5. I definitely think the relative value is right.

Finally, we asked the PEC members to review representative services across specialties. For services about which they felt knowledgeable, PEC physicians commented on the relationships across specialties. They were given lists of services in their own respective specialties, and a list of frequently performed services and corresponding RBRVs for all 18 specialties for review according to the criteria stated above.

The PEC met two weeks later to review their findings. We devoted the entire second meeting to reviewing the services that the physicians identified as outliers. Each physician gave reasons for his or her finding. The PEC members found fewer than 15 percent of the extrapolated RBRVs to be outliers. Among the outliers, several major problems were identified at the second meeting.

First, in many cases the relationship of charges in the Medicare Part B data file is not reasonable. For example, the average charge for a six-vessel coronary-artery bypass graft (CABG) is lower than the average charges for a three-vessel or four-vessel CABG. Since we surveyed a three-vessel CABG and used it as a benchmark in the CABG family, the extrapolated RBRV for a six-vessel graft became unreasonable.

Second, charge patterns in some families clearly do not reflect differences in work. Some charge data may be incorrectly coded, or Medicare Part B carriers may have used different operational systems. In urology, for example, the charges for limited office visits for new patients are almost the same as those for intermediate visits.

A third major problem identified by the PEC members involves services not actually performed by physicians. For example, in pathology a number of procedures were identified as typically performed by technicians.

A fourth problem is services that involve very specific costs for supplies or equipment. An example of such services is the supervision and provision of expensive antigens and allergenic extracts by allergists and immunologists.

Another problem is services billed in an unconventional manner. For example, intracutaneous tests by allergists and immunologists (95014-95018) are grouped into four services based on the number of tests delivered. These tests and their respective CPT-4 descriptions and codes are: 95014, 1-5 tests; 95016, 6-10 tests; 95017, 11-15 tests; and 95018, more than 15 tests. According to the PEC discussion, however, when an allergist provides 15 tests, he or she submits claims for 95014, 95016, and 95017, not just 95017.

Still another extrapolation problem involved the RBRVs for CPT-4 codes that included a global service. For instance, the extrapolated RBRV for total obstetric care was valued too low because it included only the delivery and not the prenatal and postnatal care.

Finally, several RBRV values were found to be unreasonable because they pertained to CPT-4 codes for services no longer performed.

The investigators again reviewed the RBRVs judged clearly unreasonable by PEC members. We then separated all the RBRVs into four groups: (1) services with reasonable RBRVs; (2) services with unreasonable RBRVs for known and justifiable reasons, which should be deleted (deleted RBRVs are shown in Appendix Q, Table Q.1); (3) services with questionable RBRVs that require further analysis and evaluation (shown in Appendix Q, Table Q.2); and (4) services with reasonable RBRVs judged to be obsolete by the PEC members (shown in Appendix Q, Table Q.3).

Figure 6. Partition and classification of services and procedures by hierarchical method into homogeneous groups

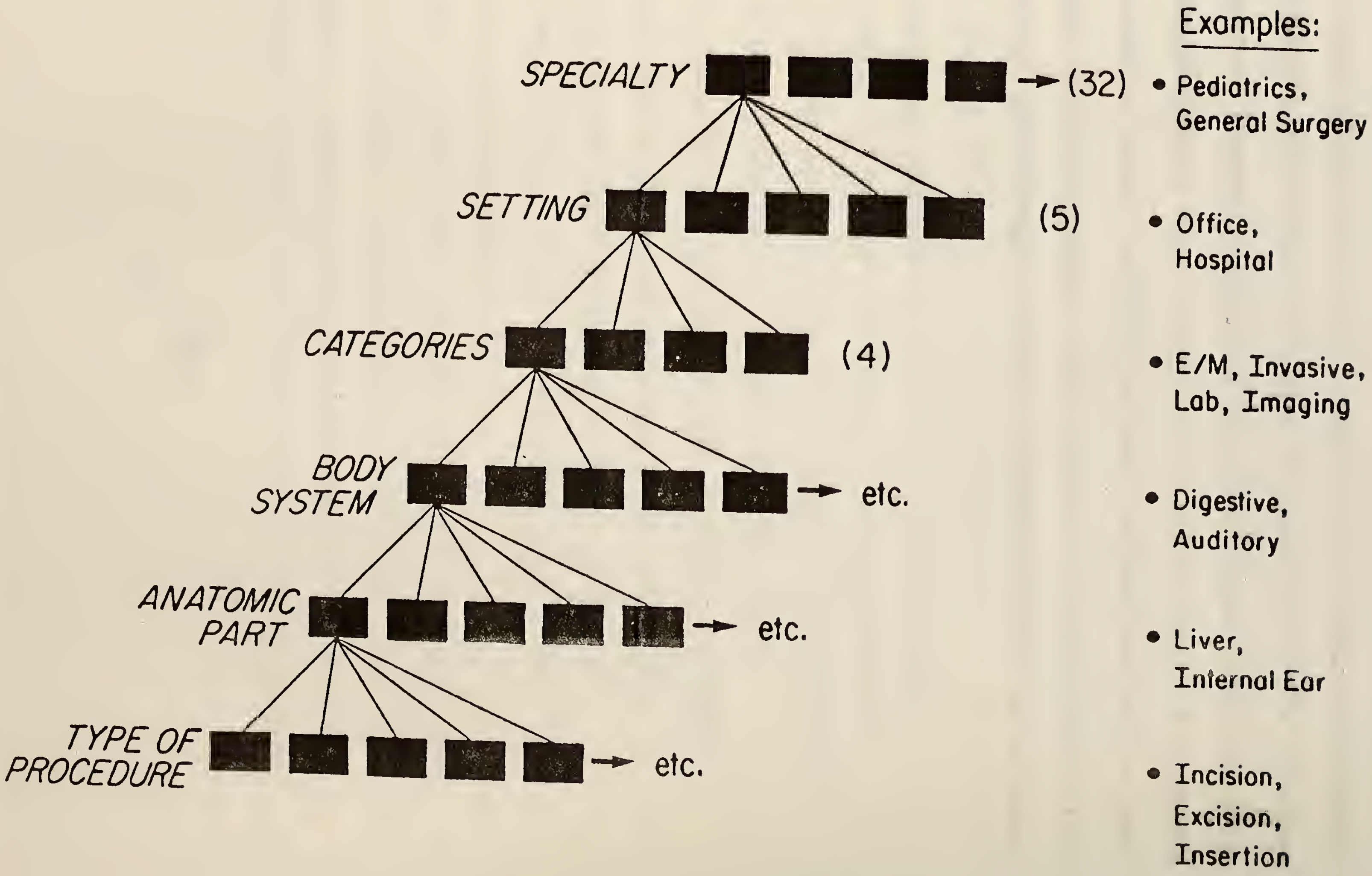
SPECIALTY
(32)
SETTING
(5)
CATEGORIES
(4)
BODY SYSTEM
etc.
ANATOMIC PART
etc.
TYPE OF PROCEDURE
etc.
Examples:
• Pediatrics, General Surgery
• Office, Hospital
• E/M, Invasive, Lab, Imaging
• Digestive, Auditory
• Liver, Internal Ear
• Incision, Excision, Insertion

Table 76

Number of surveyed services and percent of total Medicare charges they account for, by category of procedure

Category	Number of surveyed services[1]	Percent of Total charges[2]
Evaluation and management	89	48.5
Invasive	103	38.5
Imaging	31	34.1
Laboratory	20	40.4
Total	[3]243	41.6

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[1] Includes only unique HCPCS codes for all categories except evaluation and management, in which the extrapolation was specialty-specific.

[2] Charge data were obtained from Medicare Part B claims information for 1986. Pediatrics and oral and maxillofacial surgery were excluded from the calculations due to limited Medicare coverage.

[3] Net number of services is smaller than the grand total of 372 due to the following exclusions: (1) anesthesia services; (2) all services to which no HCPCS code could be assigned; (3) all services that were assigned duplicate HCPCS codes; and (4) all services for which no charge data were available.

Table 77

Number of services in RBRVS

Number of services surveyed		409
Number of services used in the data analysis		[1]407
Number of services after same cross-specialty links combined		372
Number of codes used for extrapolation		[2]293
non-specialty specific codes	187	
specialty specific patient visit codes	106	
The number of unique CPT-4 codes. This total includes one count for each patient visit CPT-4 code		227

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[1] Two services not included in the data analysis:
- Pathology D - Flow cytometric DNA analysis
- Radiology U - Interpretation of pulmonary perfusion studies for question of pulmonary embolization

[2] The number of codes used for extrapolation (293) is derived by subtracting the following from the number of services after the cross-specialty links are combined (372):

- The number of duplicate services in codes where more than one service was surveyed, 58 services

- The number of services with multiple CPT-4 codes, 15 services

- Miscellaneous services, 6 services:

  Two services deleted due to insufficient cases in the extrapolation data (24640 surveyed in Pediatrics and Orthopedic Surgery)

  Four obstetrical labor services which do not have CPT-4 codes

Table 78

Summary of regression results
(t-statistics in parentheses)

Dependent Variable: LOGWORK
(n = 174)

Variable	Model I	Model II
R2	.856	.930
Intercept	0.68** (12.31)	0.88** (13.62)
LOGCHARGE	0.76** (32.10)	0.77** (25.18)
FAM1	--	-0.28** (-3.75)
FAM2	--	-0.25** (-3.48)
FAM3	--	-0.23** (-3.08)
FAM4	--	-0.16* (-2.02)
FAM5	--	-0.22** (-2.73)
FAM6	--	-0.14* (-1.85)
FAM7	--	-0.34** (-4.62)
FAM8	--	-0.20* (-2.38)
FAM9	--	-0.43** (-6.85)
FAM10	--	-0.36** (-5.73)
FAM13	--	-0.42** (-5.13)
FAM14	--	0.41** (4.84)
FAM15	--	-0.40** (-5.17)
FAM16	--	-0.29** (-5.13)

* Indicates significant at 5 percent level.

** Indicates significant at 1 percent level.

NOTE: See following page for variable definitions.

Table 78 continued

Variable name	Definition
LOGWORK	Study value of total work, transformed to common logs
LOGCHARGE	Mean charge, transformed to common logs
FAM1	Dummy variable indicating dermatologic surgery procedures
FAM2	Dummy variable indicating orthopedic surgery procedures
FAM3	Dummy variable indicating otolaryngologic surgery procedures
FAM4	Dummy variable indicating thoracic surgery procedures
FAM5	Dummy variable indicating general surgery procedures
FAM6	Dummy variable indicating urologic surgery procedures
FAM7	Dummy variable indicating obstetrical or gynecologic surgery procedures
FAM8	Dummy variable indicating ophthalmologic surgery procedures
FAM9	Dummy variable indicating upper body radiology procedures
FAM10	Dummy variable indicating other radiology procedures
FAM11	Dummy variable indicating evaluation and management services, except psychiatry
FAM12	Dummy variable indicating psychiatric services

Table 78 continued

Variable name	Definition
FAM13	Dummy variable indicating opthalmology services
FAM14	Dummy variable indicating allergy and immunology tests
FAM15	Dummy variable indicating cardiac and pulmonary procedures
FAM16	Dummy variable indicating pathology procedures

Table 79

Percent of total Medicare charges accounted for by surveyed services and families, by category of procedure

	Percent of total charges	
Procedure category	Surveyed services	Families[1]
Evaluation and management	48.5	91.2
Invasive	38.5	72.1
Imaging	34.1	87.3
Laboratory	40.4	48.8
Total	41.6	79.9

[1] Families include surveyed services along with other members of extended families.

Table 80

Mean charges and charge-based ratios for illustrative family of services

HCPCS group: biliary tract, excision procedures[2]

CPT-4 code	Procedure description	Mean charge[1]	Charge-based ratio
47600	Cholecystectomy (N=75,620)	$1,109	1.00
47605	Cholecystectomy w cholangiography (N=111,003)	1,184	1.07
47610	Cholecystectomy w exploration of common duct (N=35,920)	1,410	1.27
47620	Cholecystectomy w transduodenal sphincterotomy or sphincteroplasty, w or w/o cholangiography (N=3,013)	1,641	1.48
47630	Biliary duct stone extraction, percutaneous via T-tube tract, basket or snare (N=1,182)	630	0.57
47700	Exploration for congenital atresia of bile ducts, w/o repair, w or w/o liver biopsy, w or w/o cholangiography (N=386)	1,116	1.01

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[1] The charge data represent a weighted average of the Medicare Part B and HIAA charges.

[2] Based on 1986 revision of HCPCS, the latest for which charge data were available.

Table 81

Charge-based ratios and extrapolated values of total work for illustrative family of services

HCPCS group: biliary tract, excision procedures[1]

HCPCS code	Procedure description	Charge-based ratio	Extrapolated value
47600	Cholecystectomy (N=75,620)	1.00	991[2]
47605	Cholecystectomy w cholangiography (N=111,003)	1.07	1,060
47610	Cholecystectomy w exploration of common duct (N=35,920)	1.27	1,259
47620	Cholecystectomy w transduodenal sphincterotomy or sphincteroplasty, w or w/o cholangiography (N=3,013)	1.48	1,467
47630	Biliary duct stone extraction, percutaneous via T-tube tract, basket or snare (N=1,182)	0.57	565
47700	Exploration for congenital atresia of bile ducts, w/o repair, w or w/o liver biopsy, w or w/o cholangiography (N=386)	1.01	1,001

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[1] Based on 1986 revision of HCPCS, the latest for which charge data were available.

[2] Represents actual study value.

Chapter 9

Relative Cost Differences Among Physicians' Specialty Practice

9.1 Overview

Our study develops a resource-based relative value scale (RBRVS) that comprises the three principal resource-inputs in performing physicians' work:

$$RBRV = (TW)(1+RPC)(1+AST)$$

where:

TW = total work input by the physician;

RPC = an index of relative specialty practice costs; and

AST = an index of amortized value for the opportunity cost of specialty training.

We have described the TW component of this work in Chapters 3 through 5. In this chapter, we discuss the construction of the index which reflects the relative differences in practice costs among medical and surgical specialties.

Physicians' practice costs are defined here as those costs of practice that exclude the physician's own time and effort. Practice costs represent a significant portion of the resource inputs necessary to perform each service. In 1986, according to American Medical Association (AMA) data, mean practice costs for self-employed physicians were $118,400; nearly 50 percent of physicians' mean gross revenue (AMA, 1987).

Any payment system should allow physicians to recoup their reasonable economic costs incurred in delivering a service including practice costs. Under the customary, prevailing and reasonable (CPR) and the usual, customary and reasonable (UCR) methods of determining physicians' charges currently used by Medicare and private insurers, respectively, the reimbursed fee paid to physicians includes payment for both the physicians' time and effort and practice costs.* In developing the relative resource costs of providing a service, an RBRVS must include a separate measure of practice costs.

Practice costs can vary widely by service, geographic region, and specialty. Obviously, the costs of producing different services can vary substantially. For instance, the cost of a telephone consultation is likely to be considerably less than the expenses associated with a comprehensive office visit for a new patient or colonoscopy for the removal of polypoid lesions.

In addition, differences in geographic location can also contribute to variations in physicians' practice costs. For example, among geographical regions, the cost of office space or labor personnel can be substantially different. In Chicago, Illinois, for instance, the mean price for office rent is more than twice the mean office rents in Muncie, Indiana. Labor costs between the two cities vary by over 25 percent (Zuckerman, 1988).

Practice costs can also vary substantially by specialty.

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* Medicare does acknowledge increases in physicians' practice costs in the calculation of it's Medicare Economic Index (MEI) used to update the prevailing physicians' charge limits.

For example, according to 1986 AMA data, 60 percent of the average gross income of physicians in general and family practice was spent on practice expenses. Practice costs for pathologists, in contrast, represented only 33 percent of their gross income (AMA, 1987).

Among specialties, there are several reasons that can account for these practice cost differences. First, there are marked differences in the nature of the work of different specialties, and therefore, the methods by which they produce their services. The costs of an office visit to a family practitioner, for instance, might typically include the labor time from other health personnel and expenditures for office space, equipment, and supplies. In contrast, a psychiatrist providing an office visit might require considerably less input from other health personnel or special equipment, thereby incurring lower overhead costs than the family practitioner. Medical malpractice premiums also vary dramatically among specialties. On average, obstetricians/gynecologists and surgeons pay malpractice premiums more than three times those of pediatricians and psychiatrists (AMA, 1987).

Second, the costs of medical practice may vary substantially depending upon the site of care. For example, physicians normally pay for all practice expenses associated with services performed in their office, while the practice expenses of services provided in the hospital are normally covered by the hospital. Specialties, such as anesthesiology, radiology, and pathology, likely incur relatively lower practice costs than other specialties because much of their practices are hospital-based (Steinwald, 1980).

Finally, specialties can choose quite different ways of organizing their practice. Due to the nature of the services performed and the site of care, some specialties are more likely to organize as partnerships or groups rather than as solo practices. If economies of scale or scope result from these organizational practices, average practice costs are reduced relative to other specialties. For example, physicians practicing in radiology are far more likely to be organized in group practices than those in the specialties of family practice or surgery (AMA, 1984B).

There are several approaches that might be considered in constructing a specialty-specific practice cost index. In the ideal case, we would like to determine practice costs at the individual service level. In this case, industrial engineering and cost accounting studies would evaluate the average time and resources involved in the delivery of each service and then calculate their 'true' costs. The practice costs associated with each service delivered by a physician could then be recouped on the basis of the quantity of services he or she delivered.

In practice, however, gathering such data would prove extremely difficult and time consuming. Physicians' Current Procedural Terminology (CPT), the unit of analysis used in our RBRVS study, contains over 7000 individual services (Coy, Fanta, Finkel, et al., 1988). Currently, there are no comprehensive data on the costs of individual services and such a study was not within the scope of our project.

Even if we were able to develop service-specific data, however, this approach would appear to be inconsistent with the current methods physicians use to allocate their overhead costs. Literature on the accounting practices for recouping increases in practice costs suggest that physicians allocate these increases over their entire mix of services (Caplan, 1987). Even in cases where one or even a few services are directly responsible for sizable changes in practice expenses, such as malpractice costs or capital costs, these higher costs are allocated over all services and not just to specific services, in effect cross-subsidizing services. Thus, while measuring the cost of services at the individual service level may seem intuitively appealing, implementing such an approach, were the data available, would be a major departure from current practice.

In addition, the measurement of geographic variations in practice costs are beyond the scope of our study and are being considered elsewhere. We feel geographic variations in practice costs are best handled in the implementation of an RBRVS. Since the RBRVS is denominated in nonmonetary units, a conversion factor must be applied to convert RBRV units into dollars. Geographic differences in input prices could be incorporated into this conversion factor. Our goal in this study is to develop a relative index which accounts for only specialty-specific practice cost differences.

In the next section of this chapter, we briefly review our methodological approach for constructing the practice cost index. In the third section we discuss the data that we used, and in the fourth section we present the results of our analysis. The final section summarizes our concluding comments.

9.2 Methods

Our approach is to apportion practice costs to each service in proportion to the total work input required by that service.* This approach follows the common accounting practice of loading overhead costs onto basic input costs, such as physicians' work. We assume that services associated with greater levels of physician inputs (i.e. total work), will generally, also require higher levels of nonphysician costs as well.

To construct the practice cost index, we use physician practice costs as a percent of physician gross revenue. For some specified time period, for specialty s, gross revenue (GR_s) can be defined as the sum of net revenue (NR_s) and practice costs (PC_s), such that

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* We also considered apportioning the overhead cost to each service in proportion to the time required by that service. This approach is not feasible. The RBRVs is based on relative units and cannot be combined with overhead cost per unit of time in dollars until a monetary conversion factor has been established.

$$GR_s = NR_s + PC_s \qquad (1)$$

Given this formulation, net revenue can be increased by some markup factor for practice costs (PCF_s) to yield GR_s

$$GR_s = (NR_s)\ (PCF_s) \qquad (2)$$

Assuming NR_s is nonzero, it can be shown from Equation (1) that this practice cost factor for specialty s is

$$PCFs = \frac{1}{1 - \frac{PC_s}{GR_s}} \qquad (3)$$

Because net revenue represents the earnings for the physician's total work (TW) for all the services the physician performs, we can represent NR_s

$$NR_s = \sum_i (X_s)\ (TW_{is})\ (Q_{is}) \qquad (4)$$

where i indexes services, Q_i is the quantity of the ith service, and X_s is a factor that converts total work to monetary terms for a specialty. Then

$$GR_s = \sum_i (PCF_s)\ (X_s)\ (TW_{is})\ (Q_{is}) \qquad (5)$$

Ignoring for now the opportunity costs of training, which are reflected as a part of our final RBRVS, we define:

$$RBRV_{is} = (PCF_s)\ (TW_{is}) \qquad (6)$$

To construct the relative practice cost index, we standardize the PCF values for each specialty to a single specialty:

$$\text{Practice Cost Index} = \frac{PCF_s}{PCF_{standard}} \qquad (7)$$

where $PCF_{standard}$ is the practice cost factor of the standard specialty. Any specialty may be used as a standard and the resultant relative relationship of the RBRVs would not vary.

9.3 Data

There are two major sources of data that could be used to develop the practice cost index: the American Medical Association's Annual Socioeconomic Monitoring System Survey (SMS) and the 1983 Physician Practice Cost and Income Survey (PPCIS).

The SMS survey is conducted annually to collect data about a range of characteristics pertaining to physicians' practices, including physicians' earnings, expenses, work patterns, and fees (AMA, 1987). Given the timely nature of the SMS survey, it would be advantageous to use these data to develop our practice cost index. However, because the SMS reports their results for only a limited number of specialties, use of these data would cover only ten of the eighteen specialties included in our study. This would require that the remaining eight specialties be assigned values based on the reported specialties. Consequently, we turned to a second source of information on physician practice costs, the 1983 Physician Practice Cost and Income Survey.

The 1983 PPCIS was conducted for HCFA by the National Opinion Research Center. A major goal of the PPCIS survey was to gather data that would provide accurate estimates on physicians' practice costs as well as other income and practice information. The sampling frame was designed to be representative of all major medical and surgical specialties as well as different geographic regions. Altogether, 4,729 physicians were surveyed from a wide range of practice settings and arrangements. Of these physicians, 2,525 physicians were patient-care physicians practicing in one of the specialties in our study. There were six major categories of physician expenses collected through the PPCIS survey which we used in our investigation. These expense categories include: office space, equipment, supplies, nonphysician wages, nonphysician fringe benefits, and malpractice premiums. A detailed discussion of this survey can be found in Sprachmen, et al. (1986).

The 1983 PPCIS survey includes specialty-specific practice cost data on all specialties in our study with the exception of oral and maxillofacial surgeons. To fill this gap, we contracted with the Center for Survey Research of the University of Massachusetts to collect 1986 practice cost data from a sample of oral and maxillofacial surgeons through a mail survey. Using practice cost questions and categories identical to those employed in the 1983 PPCIS survey, we obtained responses from 78 of the 117 oral and maxillofacial surgeons who previously had responded to our national survey of physician's work (Hsiao, Braun, Yntema, Becker, 1988). These practice cost data were merged to the 1983 PPCIS data file. To permit comparison with the other specialty data, we deflated all oral and maxillofacial surgeon's practice cost data to 1983 dollars using the physician service component of the consumer price index.

There are several shortcomings of the PPCIS data that must be addressed before the data are used. First, some of the practice cost variables from the PPCIS survey have missing values. For example, a physician might indicate on the survey that he or she employs two nonphysician employees, but not report salaries or fringe benefits for these employees.

In this instance, to avoid underestimating practice expenses for this physician, it is necessary to either drop the physician from the sample or to estimate expense values for these categories. Since approximately 1,000 cases have some missing information, dropping cases containing missing data would reduce the PPCIS sample size by approximately 40 percent. As a result, the number of physician observations in some specialties would be very small. Consequently, we imputed values for these missing categories.

Before the imputation, we dropped from the sample any physician observation with missing data on gross revenue or missing expense data for three or more of the seven practice cost categories and physicians who were not self-employed. We then estimated the missing expense data for each practice cost component for the remaining physicians using regression analysis (Dixon, 1983). Each observation in the regression analysis was a physician. The dependent variables of the regression were the missing practice cost components. We used as regression predictors the remaining nonmissing expense components and variables describing the number of personnel (nursing and non-nursing) and organization of the practice. We performed eight separate regression analyses for each component, grouping physicians by solo and group practices, and according to whether they were from surgical, nonsurgical, hospital-based, or psychiatric specialties. Finally, we also dropped all extreme outlier observations from the analysis. Outliers were defined as observations for which the ratio of practice costs to gross revenue differed from the mean ratio by more than three standard deviations.

A second shortcoming of PPCIS data is that although there are detailed questions on the components of practice costs, net income, and gross income, the survey does not include specific questions about total practice expenses. Total practice expenses are the sum of the individual expense categories, including a residual category. Residual expenses include those practice expenses not covered by the other PPCIS expense categories (such as utility expenses, practice management costs, legal expenses, and administrative expenses). However, since specific questions for the residual expenses were not included in the PPCIS survey, we had to estimate residual practice expenses using other data or construct total practice expenses using an alternative method.

We initially constructed total expenses by subtracting net income from gross income. However, due to inconsistencies in the PPCIS net and gross income estimates, using this method produced unreasonable results. Therefore, we used 1983 AMA practice cost data to estimate residual practice expenses and calculate total expenses. The AMA's Socioeconomic Characteristics of Medical Practice, 1984 (AMA, 1984) reports 1983 mean practice cost totals, including residual practice costs, for all physicians and separately for five specialties: general and family practice, general surgery, internal medicine, pediatrics, and obstetrics and gynecology.

A final concern with PPCIS data is the fact that they represent 1983 prices and practice environment. The latest SMS data show that between 1983 and 1986, the mean practice costs for self-employed physicians rose from $85,400 to $118,400, a 38.6 percent increase (AMA, 1987). To determine what impact using 1983 PPCIS data might have, we examined changes in the percentage of the components of practice costs among selected specialties since 1983. Since PPCIS data only exists for 1983, we used SMS data for 1986, the latest information available, and compared it with 1983 SMS data.*

Table 82 reports total specialty practice costs as a percentage of gross income and these percentages standardized to general surgery for all physicians and the five specialties reported in SMS data in both 1983 and 1986. Overall, for all physicians, between 1983 and 1986, practice costs as a percentage of gross revenue rose from 45.1 percent to 49.8 percent, a 4.7 percent increase. For the individual specialties the difference in these growth rates between 1983 and 1986 range from a low of 2 percent for internal medicine to a high of 5.8 percent for pediatrics. When we examine the values standardized to general surgery, however, it appears that in spite of the increase in the levels of practice costs as a share of gross revenue between 1983 and 1986, the growth in practice costs as a percentage of gross income have been fairly constant across specialties. This would suggest that overall, while there has been an increase in the share of revenue allocated to practice expenses between 1983 and 1986, this increase seems to be fairly constant for these specialties and all physicians.

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* Exact comparisons between PPCIS and SMS data are difficult to make. There are differences between the two surveys in the definitions of the practice expense components and the portion of the physician sample for which expense information is reported which would make any comparisons questionable.

One possible exception to this trend in practice costs may be the malpractice cost component. Evidence suggests that malpractice premiums have been growing rapidly in recent years and these growth rates have not been even across all specialties (Adams and Burfield, 1988). For instance, malpractice costs as a percentage of gross revenue between 1983 and 1986, have risen by 45.9 percent on average for all physicians, as is indicated in Table 83. Yet within these categories we see that there have been substantial variations in the growth of the percentages across specialties. The average pathologists' malpractice costs between 1983 and 1986 as a percentage of gross revenue declined by 4.6 percent. In contrast, for obstetrics and gynecology, the average increase over this period has been 66.1 percent.

We therefore adjusted the PPCIS malpractice cost data for each physician to reflect the growth in specialty's malpractice costs between 1983 and 1986, using the percentage change in the right most column of Table 83. For specialties not identified in Table 83, data from a specialty with the same risk level, as defined by The Medical Protective Company in July 1985, was used (The Medical Protective Company, 1985).

These differences in malpractice premium data were adjusted to 1983 dollars using the CPI index and then combined with the 1983 malpractice premium data for the physician. Because data for oral and maxillofacial surgeons were based on 1986 practice costs, we did not adjust their malpractice data.

9.4 Results

In Table 84, we report 1983 PPCIS cost shares by expense category and specialty. Several comments on the data should be made. Although there are 2,153 responses, there is considerable range in the number of physicians for each specialty. At the high end, there are 444 physicians in general and family practice, and 271 internists. In contrast, at the low end there were just 18 allergists and immunologists (not shown). Several specialties have fewer than 50 physicians -- dermatology, otolaryngology, oral and maxillofacial surgery, rheumatologists, and thoracic surgery. We used a decision rule that PPCIS data would not be used for any specialty with fewer than 20 responses. As a result, allergists and immunologists, a subspecialty of internal medicine, were assigned the same ratio of practice costs to gross revenue as internal medicine -- 47.2.

In Table 85, we display the practice cost factor for each specialty calculated from practice costs as a percentage of gross revenue using Equation (3). These calculations are based on the total cost shares shown in Table 84. In the second column in Table 85, we display the practice cost index used to calculate the resource-based relative values. These ratios are standardized on general surgery as specified in Equation (7). The relative practice cost factor (RPC), which is equal to the standardized cost factor minus one, represents the percentage difference between each specialty and the specialty used as the standard - general surgery. These values are presented in the last column in Table 85.

For most specialties the range for RPC falls between -0.09 and 0.06, a 15 percent range. There are several specialties where the impact is much greater. For example, the specialties of pathology and psychiatry, respectively, show average practice cost ratios 23 and 33 percent below the average for general surgeons. In contrast, the RPCs for the specialties of rheumatology and orthopedic surgery are 14 and 24 percent higher, respectively, than general surgery, the standard specialty.

9.5 Comments

As noted above, the practice cost index only considers specialty-specific difference in practice costs. Service-specific differences or differences due to other factors such as geographic variation would have to be addressed in the monetary conversion factor, if the RBRVS is used in establishing a fee schedule.

Several comments about the practice cost index should be noted. First, our practice cost index is based on data which are five years old. Conceptually, because we are developing a relative cost index among specialties, the lack of current levels of the cost data are not problematic if the relative relationship of costs among the specialties has remained constant over time. Comparisons of the 1983 and 1986 AMA cost share data in Table 82 would suggest that these cost relationships, with the exception of malpractice costs, have remained fairly constant for some of the major specialties. However, for many of the specialties included in our study, no comparable practice costs data is available. In light of the substantial changes that have occurred in the health care environment since 1983, accurate and updated practice cost data for each specialty is essential to insure that practice cost reimbursement levels are fair and equitable.

Second, using gross revenue in the calculation of the practice cost index may lead to distortions due to the different levels of net revenue that have developed historically among specialties. If the practice cost ratios are adjusted periodically as changes in practice patterns, practice costs, and gross incomes evolve, the impact of these distortions among specialties should be minimized.

Third, our approach for allocating practice costs over all the services provided by the physician does not distinguish between services provided in office and nonoffice setting. It might be argued that physicians do not directly incur expenses while practicing in the hospital and, consequently, practice costs should not be spread to these hospital services.

It is clear, however, that physicians, even when practicing in the hospital, must maintain certain fixed costs (those practice cost obligations which are necessary to maintain medical practice regardless of the level of patient activity, such as, office space, malpractice insurance and equipment) irrespective of where they are practicing. If we assume in addition to these fixed costs that half the physicians' variable costs (those practice costs that vary with the level of patient activity, such as, staff wages and fringe benefits, supplies and other costs) are also fixed in the short-run, our estimates show that 64 percent of the average physicians' expenses are essential costs regardless of where the physician practices. The variable and fixed estimates of cost for each specialty are constructed from Table 84 and shown in Table 86. For some specialties, such as thoracic surgery, these fixed costs are as high as 75 percent of total costs.

Fourth, economic theory suggests the optimal pricing policy is to set fees according to marginal costs (Pauly, 1980). Because of the heterogeneity of physician services and the variety of ways physicians organize their practices, the measurement of marginal costs and their application to pricing when setting fees is an extremely difficult task. Our method of allocating the practice costs uses average costs. Since physicians have high proportions of fixed costs, average costs exceed marginal costs. Hence, the average cost approach utilized in the RBRVS study will provide physicians with additional profit if their volume of services exceeds the average volume performed per year by each physician in that specialty.

Fifth, it might be argued that loading practice costs on total work is unreasonable because practice cost may not vary proportionally with total work, but are more closely associated with the time the physician spends performing their services. As a consequence, the RBRVs for services that require greater intensity of physician work input but only average overhead costs will be overstated. Without detailed information on the actual practice costs of providing each service, it is difficult to evaluate what distortion, if any, is caused by the impact of our method of loading practice costs onto total work.

Finally, we have discussed the serious difficulties of updating practice costs and apportioning the costs appropriately to each service. Our method of treating the practice costs, we believe, is adequate for the construction of an inter-specialty relative value scale. Our values reflect a specialty physicians' relative resource costs expended in performing various medical and surgical services. However, alternative methods of treating practice costs may give policy makers greater flexibility and accuracy in assigning practice cost values.

One option which should be considered is to treat practice cost independently from the RBRVS. In this case, the resource-based fee for service a might be constructed as follows:

$$\text{Fee of Service}_i = (TW_i)(1+AST_s)(\$) + (APC_i)$$

where:

TW_i = total work input by the physician for service i;

AST_s = the index value for the opportunity cost of specialty training for specialty s;

\$ = factor that converts TW and AST to monetary terms; and

APC_i = average practice cost for service i.

Further, the average practice cost for a service could be estimated by a method such as using the average practice costs per minute for a specialty and the average time spent in performing the service. An adjustment for any extraordinary capital costs or malpractice costs attributed to the service or the site of care (office versus hospital) could also be incorporated.

The separate treatment of practice costs in a fee schedule, would provide policymakers with the flexibility to: 1) update the practice costs frequently; 2) distinguish unusual cost components such as malpractice premiums for special treatment;

3) incorporate regional cost differences; 4) incorporate service-specific capital costs; and 5) distinguish costs for professional and technical components of diagnostic, imaging, and laboratory tests.

Table 82

Practice costs as a percentage of gross revenue and 1983 and 1986 Socioeconomic Monitoring System Survey, selected specialties

	1983		1986	
Specialty	Practice cost to gross revenue	Standardized to general surgery	Practice cost to gross revenue	Standardized to general surgery
General/Family Practice	54.3	1.24	59.9	1.25
Internal Medicine	48.3	1.10	50.3	1.05
Surgery	43.8	1.00	47.8	1.00
Pediatrics	47.5	1.08	53.3	1.12
Obstetrics/Gynecology	47.9	1.09	52.3	1.09
All Physicians	45.1	1.03	49.8	1.04

NOTE: For 1983 and 1986, the American Medical Association only reported expense data for self-employed physicians, and gross revenue for all physicians. These numbers were used in the calculations reported and have the effect of underestimating gross revenue and inflating the percentages by approximately two to three percent.

SOURCE: American Medical Association. Socioeconomic Characteristics of Medical Practice, 1987.

Table 83

Comparison of physician malpractice costs as a share of gross revenue (percent), 1983, 1986

	Percentage malpractice costs of gross revenue		
Specialty	1983*	1986*	% Change 1983-86
Anesthesiology	6.1 %	8.3 %	36.1 %
General & Family Practice	2.9	3.7	28.1
General Surgery	4.3	6.9	60.5
Internal Medicine	2.5	3.3	32.0
Obstetrics & Gynecology	6.2	10.3	66.1
Pathology	2.2	2.1	-4.6
Pediatrics	2.9	3.6	24.1
Psychiatry	1.7	2.4	41.2
Radiology	2.5	3.2	28.0
Other	2.8	3.8	35.7
All Specialties	3.7	5.4	45.9

SOURCE: American Medical Association. Socioeconomic Characteristics of Medical Practice, 1987.

Table 84

1983 Physician practice costs as a percentage of gross revenue by specialty[1]

Specialty	Number of obs	Office rent	Eqpmnt	Suppls	Non-mdwage	Fringe benefs	Malprc	Residl	Total
Anesthesiology	152	1.4 %	0.3 %	1.5 %	11.2 %	11.9 %	10.7 %	7.1 %	44.1 %
Dermatology	33	7.2	1.6	5.8	17.8	5.9	2.0	5.5	45.8
Family Practice	444	5.5	2.1	8.3	20.4	3.8	3.9	4.4	48.4
General Surgery	166	5.2	1.1	4.5	13.7	6.8	9.8	6.7	47.9
Internal Medicine	271	6.7	2.2	6.1	18.7	4.1	3.5	5.8	47.2
Obstetrics & Gynecology	174	5.1	2.1	5.3	15.9	4.1	11.3	3.9	49.6
Ophthalmology	106	7.4	3.3	6.8	16.9	3.8	3.8	7.1	49.1
Oral Maxill. Surgery	45	7.6	4.2	8.1	16.6	3.2	4.0	5.0	48.7
Orthopedic Surgery	87	6.0	2.5	6.6	18.2	7.7	8.9	8.0	58.0
Otolaryngology	41	6.1	1.6	4.3	18.9	5.4	7.2	7.2	50.7
Pathology	69	1.5	1.2	3.8	10.3	9.1	2.4	4.1	32.5
Pediatrics	145	6.6	1.8	8.1	20.4	4.7	3.4	1.4	46.3
Psychiatry	177	5.9	0.9	1.0	6.8	2.8	2.4	2.5	22.5
Radiology	94	2.4	2.1	5.1	12.0	11.1	4.3	5.6	42.6

Table 84 continued

1983 Physician practice costs as a percentage of gross revenue by specialty[1]

Specialty	Number of obs	Office rent	Eqpmnt	Suppls	Non-mdwage	Fringe benefs	Malprc	Residl	Total
Rheumatology	21	9.0	2.2	6.5	19.7	8.8	1.9	6.3	54.4
Thoracic Surgery	20	6.8	4.0	1.5	9.1	4.7	10.7	6.2	43.1
Urology	108	5.6	2.2	7.4	14.5	6.5	6.0	7.3	49.5
TOTAL	2153	5.4	1.8	5.8	16.1	5.7	5.6	5.1	45.5

NOTE: Malpractice and the residual category have been adjusted (see text).

NOTE: Percentages may not sum to total due to rounding.

SOURCE: 1983 NORC Physician Practice Cost Survey

Table 85

Practice cost factor and standardized practice cost index

Specialty	Practice cost factor (PCF)[1]	Standardized cost index[2]	Relative practice cost index (RPC)
Allergy and Immunology	1.89	0.99	-0.01
Anesthesiology	1.79	0.93	-0.07
Dermatology	1.85	0.96	-0.04
General and Family Practice	1.94	1.01	0.01
General Surgery	1.92	1.00	0.00
Internal Medicine	1.89	0.99	-0.01
Obstetrics and Gynecology	1.98	1.03	0.03
Ophthalmology	1.97	1.02	0.02
Oral-Maxillofacial Surgery	1.95	1.02	0.02
Orthopedic Surgery	2.38	1.24	0.24
Otolaryngology	2.03	1.06	0.06
Pathology	1.48	0.77	-0.23
Pediatrics	1.86	0.97	-0.03
Psychiatry	1.29	0.67	-0.33

Table 85 continued

Practice cost factor and standardized practice cost index

Specialty	Practice cost factor (PCF)[1]	Standardized cost index[2]	Relative practice cost index (RPC)
Radiology	1.74	0.91	-0.09
Rheumatology	2.19	1.14	0.14
Thoracic Surgery	1.76	0.92	-0.08
Urology	1.98	1.03	0.03

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[1] PCF_S = 1 / (1-(Practice Costs / Gross $Revenue_S$)

[2] RPC is PCF standardized on General Surgery

Table 86

Estimated variable and fixed practice costs by specialty, 1983[1]

	Share fixed practice costs*	Share variable practice costs*
Anesthesiology	64.1%	35.9%
Dermatology	61.8	38.2
Family Practice	61.9	38.1
General Surgery	66.8	33.2
Internal Medicine	63.2	36.8
Obstetrics and Gynecology	68.6	31.4
Ophthalmology	64.8	35.2
Oral-Maxillofacial Surgery	66.2	33.8
Orthopedic Surgery	65.0	35.0
Otolaryngology	64.7	35.3
Pathology	57.9	42.1
Pediatrics	62.7	37.3
Psychiatry	70.6	29.4
Radiology	60.3	39.7
Rheumatology	62.0	38.0
Thoracic Surgery	75.0	25.0
Urology	63.9	36.1
Total	64.1	35.9

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[1] Fixed and Variable practice cost shares are estimated from Table 84. The fixed practice cost share equals the sum of the share of office rent, equipment, and malpractice expenses plus one half the share of supplies, nonphysician wages and fringe benefits, and other category. Variable costs equal the remaining half of supplies, nonphysician wages and fringe benefits, and other category.

SOURCE: 1983 NORC Physician Practice Cost and Income Survey

Chapter 10

Measurement of the Amortized Costs of Specialty Training

10.1 Background

The length of time a physician spends in training for medical practice varies by specialty, historically ranging from one year of post-medical school training for a general practitioner to seven years for a neurosurgeon or thoracic surgeon. (AMA, 1988) These different training requirements reflect, in part, the varying scope of services provided by the typical physician in each specialty and the knowledge needed to perform the services.

A physician incurs economic costs with each additional year of specialty training. The major component of these costs derives from the value of the income earnings opportunities foregone by the trainee. The opportunity costs of a year of training can be approximated by the difference between a resident's salary and the income the resident could earn in practice.

Residency training and its cost can be termed an investment in the "human capital" of the physician. (Becker, 1964; AMA, 1987). A more comprehensive training program increases the physician's ability to perform certain services and procedures. Human capital theory suggests that an increase in future earnings will result from an increase in physician productivity, and will provide a positive return on the investment in medical training.

Selected physicians' services require certain abilities obtained primarily through advanced residency training. The respondents who rated any one of these services in our survey were from specialties whose physicians have undergone this level of training and are qualified to rate the service's total work requirements. The ratings of total work by these physicians reflect their higher productivity in performing the selected services. (This higher productivity is manifest in lower time and intensity requirements to perform a service). The total work ratings do not compensate the specialist for the incurred cost of the productivity enhancement from additional years of residency training.

10.2 Method

We adjusted the ratings of total work to include the relative opportunity costs of specialty training. We assumed that physicians who undertake residency training programs beyond a single year of internship incur yearly positive opportunity costs equal to the difference in salary between that of a resident and of a reference group of practicing physicians of a comparable age. The sum of opportunity costs (OC) for specialty s, taken over the duration of residency programs can be expressed by:

$$OC_s = \sum_t^a X_t(1+r)^{a-t}, \ (t=1,...,a) \qquad \text{(Equation 1)}$$

where for each specialty s

X_t = (reference group net income for Year t) - (resident salary for Year t for a given year),

r = annual interest rate,

a = number of years of residency programs, and

t = counter for the number of years from the beginning of residency.

We amortized the opportunity cost of training over the expected working lifetime of the physician. The opportunity costs reimbursed in any one year were calculated as a percentage of physician net income. We assumed that physician net income grew at a constant annual rate. The annual opportunity cost payment as percentage of net income for specialty s is:

$$d_S = (OC/Y) \quad * \left| \frac{1 - \left| \frac{(1+g)}{(1+r)} \right|^{x-a}}{1 - \left| \frac{(1+g)}{(1+r)} \right|} \right|^{-1} \qquad \text{(Equation 2)}$$

where for each specialty s

g = annual growth rate in physician net income,

Y = mean net income of all physicians in the specialty, and

x = the estimate of physician retirement year for the specialty.

The total work ratings are adjusted by the relative percentage markup of net income to include opportunity costs. The markup factors are specialty-specific. The total work ratings of all services in a specialty are adjusted by the same amount. The index for the amortized value of the opportunity cost of specialty training (AST) of specialty s was measured relative to that for general surgery:

$$AST_S = \frac{(1+d_S)}{(1+d_{GS})} -1 \qquad \text{(Equation 3)}$$

where d_{GS} is the annual opportunity cost as a percentage of net income for general surgery.

10.3 Data

To perform these calculations specialty-specific data were needed on the length of residency training programs, career lifetime, residency salaries by year of residency, net incomes of physicians, and age adjusted net incomes of the reference group physicians. Values for the interest rate and the growth rate of physicians' incomes must also be assumed.

We obtained data about the length of residency training programs from the individual specialty boards. (AMA, 1988). Career lifetimes, residency salaries by year of residency and physician net incomes for most specialties were obtained from the American Medical Association. (AMA, 1987c). For the remaining specialties, physician mean net incomes were estimated from data available from the national survey conducted by Medical Economics. (Holoweiko, 1987; Owens, 1984, 1985, 1987) Mean net incomes of general practitioners 35 years of age and under (AMA, 1987) served as the reference group income data for all specialties for all years of residency, with the exceptions of allergy and immunology, rheumatology, oral and maxillofacial surgery, (AAOMS) and thoracic and cardiovascular surgery.* Finally, we assumed average values of 0.09 for the interest rate and 0.06 for the average growth rate of physicians incomes. These values are consistent with long term trends observed in interest rate and physician income data. Analysis showed the relative results were not very sensitive to the assumptions of different values of r and g within a relevant range.

10.4 Results

Table 87 shows the results of the calculations. The third column contains the estimate of total opportunity costs (OC_s). The total opportunity costs range from $63,000 for family practice to $373,600 for thoracic surgery. This range reflects the lengths of residency training programs of all the specialties, as well as the levels of reference group incomes foregone during residency training. The third column of the table contains the annual opportunity cost payment as a percentage of net income (d_s), while the fourth column is the relative opportunity cost factor ($1+AST_s$). The value of the index of opportunity costs is shown in the rightmost column.

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* We assumed residents in allergy and immunology, and rheumatology could alternatively practice as internists after the third year of residency, oral maxillofacial surgery residents could practice as dentists for all years of residency, and thoracic and cardiovascular surgery could practice as general surgeons after the fifth year of residency.

The annual percentage of opportunity costs of net income ranges from a minimum of 2.8 percent for internal medicine to a maximum of 9.2 percent for thoracic and cardiovascular surgery. The opportunity cost index show a minimum value of -0.01 (internal medicine) and a maximum value of .05 (thoracic and cardiovascular surgery). This suggests a maximum relative impact of opportunity costs on total work values of approximately six percent.

Table 87

The amortized cost of specialty training: opportunity costs expressed in absolute and relative terms

Specialty	Number of years of residency	Career lifetime	Total opportunity cost in 1000s	Annual opportunity cost as a percent of net income	Relative opportunity cost factor (1+AST)	Index of relative opportunity costs (AST)
Allergy and Immunology	5	35.2	$ 182.8	7.35 %	1.03	0.03
Anesthesiology	4	31.6	111.0	3.47	0.99	-0.01
Dermatology	4	35.2	101.8	3.57	0.99	-0.01
Family Practice	3	34.1	63.0	3.52	0.99	-0.01
General Surgery	5	35.0	152.7	4.15	1.00	0.00
Internal Medicine	3	35.2	68.6	2.76	0.99	-0.01
Obstetrics and Gynecology	4	33.8	108.2	3.59	1.00	-0.01
Ophthalmology	4	35.0	112.5	2.92	0.99	-0.01
Oral and Maxillofacial Surgery	4	35.0	114.8	3.71	1.00	0.00
Orthopedic Surgery	5	35.0	152.7	3.21	0.99	-0.01
Otolaryngology	5	35.0	152.7	4.29	1.00	0.00
Pathology	4	33.4	113.3	3.74	1.00	0.00
Pediatrics	3	34.4	70.7	3.85	1.00	0.00
Psychiatry	4	35.1	98.0	4.72	1.01	0.01
Radiology	4	33.0	107.1	2.90	0.99	-0.01

Table 87 continued

The amortized cost of specialty training:
opportunity costs expressed in absolute and relative terms

Specialty	Number of years of residency	Career lifetime	Total opportunity cost in 1000s	Annual opportunity cost as a percent of net income	Relative opportunity cost factor (1+AST)	Index of relative opportunity costs (AST)
Rheumatology	5	35.2	$ 182.8	7.35 %	1.03	0.03
Thoracic and Cardiovascular Surgery	7	35.0	373.6	9.16	1.05	0.05
Urology	5	35.0	152.7	4.39	1.00	0.00

Chapter 11

The National Consultative Conference

11.1 INTRODUCTION

The National Consultative Conference was held March 24th through 25th, 1988, at the American Academy of Arts and Sciences in Cambridge, Massachusetts, preceded by an opening session on the evening of March 23rd at the Charles Hotel, also in Cambridge. The conference was attended by 120 leaders of the medical community, insurers, labor, employers, consumers, researchers, and government. Table 88 is a list of those attending the Conference and their institutional affiliations

The purpose of the Consultative Conference was threefold: (1) to provide information on the major technical aspects of the study; (2) to preview some of the preliminary results and their implications; and (3) to solicit informed and candid comments on the RBRVS's features and relative merits from the attendees. Based on these comments we would identify areas of general agreement or residual controversy about the validity and credibility of the technical aspects of the study. In addition, through the Consultative Conference, the investigators would be able to identify areas in which further study was needed. We planned to follow up immediately with investigations on the major unresolved technical issues.

Presentation of the results required a well-organized forum. First, since the RBRVS is a relatively new approach, its distinct strengths and limitations needed careful exploration. Second, the presentation of results highlighted important advances made by the study, for example, the measurement of "total work." Both of these factors required a forum that permitted careful and coherent presentation.

Interested parties needed an opportunity to suggest improvements and express their concerns to us. The project needed a formal process to seek and hear these views thoroughly. A purpose of the Consultative Conference was to promote this exchange.

The keynote speech on the evening was given by William Roper, M.D., Administrator, U.S. Health Care Financing Administration. His speech put the RBRVS in the larger context of reform of physician payments, particularly payments by Medicare. He warned that the RBRVS is not a panacea for all problems with financing physician services. While encouraging conference attendees to view critically the RBRVS, he urged them not to let "the perfect be the enemy of the good."

The conference was chaired by Frederick Mosteller, Ph.D., of Harvard University. He opened the conference on the morning of March 24, welcoming the attendees. Prof. Mosteller emphasized that the study was ongoing, and that the results being presented were preliminary. Prof. William C. Hsiao gave an overview of the RBRVS and the planned structure of the conference. The conference structure was designed around five discussion papers by RBRVS study staff. Table 89 is the agenda of the conference. For each paper in turn, the authors gave a brief presentation, discussants reviewed the paper, and the floor was open for comments and questions. (Cleve Killingsworth, M.P.H., substituted for Howard J. Berman, Ph.D., in commenting on RBRVS preliminary results. Both are affiliated with Blue Cross/Blue Shield of the Rochester Area. Dr. Berman was unable to attend the conference because of a family emergency.) The discussants are 12 nationally recognized experts who were invited to review and criticize the papers. Discussants and attendees had received copies of the papers by mail several weeks in advance of the conference. The papers contained methods, data, and preliminary results.

11.2 MEASUREMENT OF WORK

The topic of the first paper was the measurement of work. In the paper we described briefly the previous studies of resource-based relative value. We presented the approach to measuring physician work that was developed for this study. We described the design of surveys used to collect the data on work. Finally, we discussed and evaluated our preliminary results. Peter Braun, M.D., and Douwe Yntema, Ph.D., presented the paper. Prof. Mosteller moderated the session.

The first discussant was Bert Green, Jr., Ph.D., of Johns Hopkins University. In summary, he said that the strategy of the study "seems to me a sensible scientific strategy . . . [but] we need to know even more about the components [of work] than has been reported." He wished for more analysis of the dimensions of work. He would have chosen category rating rather than magnitude estimation to obtain physicians' ratings of work, but "magnitude estimation and category rating are equally good." He wrote and said that "the results [of an analysis of variance of ratings of work] indicate very good agreement across individuals, and indicate that the scales are reliable. In fact this level of reliability of individual ratings is about as good as can be obtained with global ratings." Prof. Green took exception with our claim that there is no way to know if the obtained agreement is based on reality, insisting that "the reliabilities indicated clearly that the [physicians] rated something real." Regarding the sample, Prof. Green wrote that it "is large enough to be believed," and that "there need be little concern for representativeness," but nevertheless urged that there be analysis of the characteristics of the nonrespondents. (See Chapter 5.) Dr. Yntema had raised the question of whether analyzing logarithms rather than untransformed ratings of work was appropriate. Prof. Green found that taking logarithms was "just the right thing to do." In summary, he wrote that "the report of results is skimpy . . . The resulting scale is technically sound, reliable and reproducible. . . I see no 'fatal flaws'."

The other discussant of measurement of work was Thomas L. Delbanco, M.D., of Beth Israel Hospital. In the context of calling the RBRVS "an extraordinary contribution, he made four suggestions for further analysis or change. They were: 1) We should investigate further the differences between respondents and nonrespondents on the premise that the doctors who were busier seeing patients were less likely to respond; 2) The panels of doctors who helped to build the RBRVS should not be the ones to evaluate it; 3) The amount of pre-service work for a given service may vary a lot from day to day and from situation to situation, and is more vulnerable to discrepancy between physicians reported work and actual work, and possibly should not be used "so seriously" in the RBRVS; and 4) we, the RBRVS investigators, should consider how to reflect that more experienced physicians may perform a service in less time, perhaps with greater intensity. With regard to who should evaluate the RBRVS, Dr. Delbanco suggested sending out to a random group of physicians three sets of results to see if the physicians can tell the difference between one that is the RBRVS that we develop, and two that are purposely wrong.

11.3 CONSTRUCTION OF THE INTER-SPECIALTY RELATIVE VALUE SCALE

The topic of the second paper was the structured, quantitative method for linking separate specialty-specific relative values scales to one another, resulting in an RBRVS using a common measure across the different specialties. The TCG process was explained in detail by the presenters, and by members of the cross-specialty panel. Dr. Yntema and Dr. Braun presented the paper and Samuel O. Thier, M.D., of the Institute of Medicine moderated the session.

Dr. William Drucker, M.D., of Stong Memorial Hospital, identified five issues surrounding the RBRVS. The first was that of "'fairness' among the rewards that are given to physicians who perform services for patients." The second was the "political problem" of the dollar value to be assigned to physicians' services. The third was how medical education would be financed if physician payment were based on the RBRVS. The fourth was the way that RBRVS takes into account that more than one physician may be caring for patients with multiple illnesses. Finally, Dr. Drucker pointed out that the RBRVS will need to be updated periodically, because some new technologies will become routine, and some will be phased out.

William N. Kelley, M.D., of the University of Michigan, said that he thought it was important for subspecialties to be examined separately in the development and evaluation of the RBRVS. He said that it was important for the expertise and competence of individual physicians, quality of care, and access to care to be taken in to account. He discussed that the nature of care offered by different specialties for patients with the same diagnosis will vary. For example, a primary care physician would respond differently from a rheumatologist to a patient with fibrositis.

James H. Ware, Ph.D., of Harvard University, spoke primarily from a statistical point of view, dividing his talk in three subtopics: the conceptual framework, the methodology, and technical details. In speaking of the conceptual framework, Dr. Ware said that his is "very enthusiastic about the general approach that's reflected in this work. What I like about it is that it provides a quantitative and objective framework." He said that there are omissions that are built into the methodology, ". . . we have to recognize the limitations of quantitative methodology to fully capture all these dimensions of this enterprise, and therefore we have to view this as . . . a perspective on the system, but not a total model for the entire system." He mentioned that the RBRVS does not vary with physician quality, nor take into account that some physicians teach as they preform some of the services. Dr. Ware explicitly endorsed the use of logarithm work for purposes of analysis. He said that there needed to be more analysis of the sensitivity of the results to the way the vignettes were written and to which service was chosen as the reference. Dr. Ware said that he needed to know more about nonrespondents, about inconsistencies among physicians, and about how interviewers functioned. He thought that the identification of linking services was pivotal, "Once those linking services . . . are selected, . . . I feel very comfortable with the [quantitative] methodology that's used to try to develop a common scale. Indeed, the evidence we have . . . is extremely encouraging . . . about the internal consistency, the reliability across specialties." Dr. Ware was concerned that if the services of some specialties tend to be relatively complex, "that is going to introduce some systematic bias . . ." Another theme in Dr. Ware's talk was that we should do more statistical analysis and look more closely at the data.

11.4 METHOD OF GENERALIZATION FROM SURVEY DATA

The topic of the third paper was the method of generalization of survey results to the remainder of CPT-4 codes by extrapolation. We were constrained by the unavailability of data measuring work inputs for nonsurveyed services. The method we used is based on the assumption that within small, homogeneous families of services, ratios of charges parallel ratios of work inputs. We assume that the distortions in charges, distortions that gave rise to this study, are between these families of services, not within, because within the families the same market forces and imperfections generally apply across services. For example, within a family, services generally receive the same insurance treatment. Thus we use relative charges within a small family of services, and the work input of a surveyed service in that family, to impute the work inputs of the nonsurveyed services in the family. Families of services were defined according to specialty, setting, category (evaluation and management, invasive, laboratory, imaging), body system, anatomic region, and type of procedure (for example, incision or excision). The paper was presented by Nancy Kelly, D.Sc., and the session was moderated by Harvey V. Fineberg, M.D., Ph.D., of Harvard University.

W. Knox Fitzpatrick, Jr., M.D., of Blue Cross and Blue Shield of Utah, reviewed and discussed the extrapolation method. He emphasized the magnitude of the extrapolation, saying that when up to 20 CPT-code modifiers are taken into account, we are extrapolating from 340 surveyed services to 70,000 procedures performed by 441,000 providers, and thus the accuracy of the extrapolation is very important. (For the extrapolation method and the universe of CPT-4 codes for which we derived RBRVs, see Chapter 8.)

Dr. Fitzpatrick questioned the homogeneity of the families of procedures. He cited a difference of 600 percent in the average time required to perform a cholecystectomy by various providers within the same hospital. Further, he stated that the population of physicians doing cholecystectomies may not be the same as those doing common bile duct explorations, although the two procedures are in the same family. Dr. Fitzpatrick said that some services are more homogeneous with respect to global fees than others, for example, a tonsillectomy is homogeneous, drainage of a pancreatic abscess is heterogeneous. Dr. Fitzpatrick indicated that the assumption of linearity in the extrapolation create a possible problem: that the outcome might differ if a different benchmark were chosen. He said that the assumption that use of charge data is valid requires further testing. Dr. Fitzpatrick stressed that inclusion of more surveyed services would strengthen the accuracy of the extrapolated values for nonsurveyed procedures.

Dr. Fitzpatrick made predictions about the acceptance of the RBRVS by physicians and the implementation of an RBRVS-based payment policy by HCFA. In closing, he said that if assessment of the RBRVS "is based on an appreciation of a studied, rational method of reimbursement based on the assumptions made, which in [his] view are largely valid, then it can only be counted as an improvement over the existing system, which is inconsistent, illogical, everchanging, and inflationary."

Barbara J. McNeil, M.D., Ph.D., of Harvard University, divided her criticisms in to three categories: 1) coding issues; 2) charge data issues; and 3) survey data issues. With regard to coding, Prof. McNeil said that there may be too many CPT codes in some areas, recognizing differences in procedures at an unnecessarily detailed level. Also, physicians code what they do differently. These inaccuracies and the unevenness of detail of the CPT system may make it inappropriate to base a new payment system on the CPT. Prof. McNeil questioned the validity of the charge data as a proxy for relative physicians' work because technicians' and physicians' work may be blended in charges: in radiology, typically the nonphysician component is about two-thirds of the total charge. Also, the charge data may be inaccurate because of inconsistency of coding among physicians for the same procedure: there are redundancies in the CPT coding system. Prof. McNeil expressed concern that geographic variation and specialty mix may be captured in the charge data, and if they were also incorporated in a conversion factor, they would be double-counted. Regarding survey data, Prof. McNeil questioned the extent to which the survey respondents actually performed the procedures they rated. She also expressed concern that the respondents' ratings might vary substantially according the severity of illness they were assuming in association with a given vignette on the survey.

11.5 PRACTICE COSTS

The topic of the fourth paper was the way in which practice costs were incorporated into the RBRVS. The practice cost indices are specialty specific, and are derived from the 1983 Physician's Practice Cost and Income Survey data, adjusted to reflect the relative level of 1986 specialty malpractice costs. The paper was presented by Edmund R. Becker, Ph.D., and Dean Fineberg continued in the role of moderator.

Stephen Zuckerman, Ph.D., discussed the RBRVS treatment of practice costs. In particular, he was concerned that the practice-cost data include physicians' fringe benefits and physician-employees' salaries, resulting in double-counting. Since all physician compensation should be reflected in the measure of work, fringe benefits should be subtracted from practice cost data before deriving practice cost indices, and that this would cause the relative relationships between specialties to shift dramatically. Dr. Zuckerman also questioned the appropriateness of paying different amounts for the same procedure when it is done by physicians of different specialties. Dr. Zuckerman advocated applying the practice-cost adjustment prior to the cross-specialty linking process, thus producing an RBRVS that would be invariant with respect to specialty. He also critcized incoporation of practice costs into the RBRVS in proportion to total work, saying practice costs may be more closely related to time.

11.6 RBRVS RESULTS AND THEIR IMPLICATIONS

The fifth paper showed preliminary RBRVS and discussed their implications. The preliminary RBRVS was compared with established fee schedules of Ontario and British Columbia, finding the RBRVS to be very similar to the fee schedules. Prof. Hsiao discussed limitations of the RBRVS -- its limited precision, and factors not included such as severity of illness, variations between physicians in the complexity of cases, and differences in work input of residents between teaching and community hospitals. Prof. Hsiao presented the paper, and the session was moderated by David E. Rogers, M.D., Cornell University.

Mr. Killingsworth described the process whereby physicians negotiate a relative value scale that forms the basis for physician payments in his community. He talked about having to strike a balance at Blue Cross/Blue Shield of the Rochester Area between paying physicians too little, resulting in reduced access, or too much, which "directly affects their bottom line." Mr. Killingsworth said of the RBRVS that "it's pretty clear that it's substantially a very sensible kind of process that has been gone through to create this scale." He emphasized that attention should be give to the process of implementation to make sure the RBRVS can be deployed successfully.

Lucian Leape, M.D., of Tufts Medical School, said that "the current payment system is a terrible mess . . . certainly it's exceedingly complicated; it's certainly unfair; there are gross distortions; and we've got to do something about it." He said, "Clearly the RBRVS is not very likely to do much for the problems of the administration or the provision of inappropriate care, which is one of the hopes that people have had for it, because it doesn't fundamentally get at the issue of controlling the volume of services. But on the other hand it can do something about the problem of inequities and unfairness." He cited as strengths of the study its open and explicit process of development, the employment of physicians to appraise their own work, and the RBRVS's incorporation of "the essential ingredients" -- work, specialty training opportunity costs, and practice costs. He said, "It can't cover everything, and I frankly don't think they should worry too much about not including case mix and patient preference, teaching costs, and that sort of thing." He predicted general acceptance of the RBRVS because, he said, it seems fair.

Prof. Leape said that he was "worried about those nonrespondents" on the premise that they are the busy doctors, the ones it is most important to survey. He said he was also "a bit concerned about the doctors' ability to estimate their own times," and urged comparison with operating room logs. (We did follow this advice; for results, see Chapter 5.) He tentatively advocated developing pre- and post-service work specifically for each procedure, saying "it may not have much of a significant effect" and "if you have the basic intra-procedural work you'll have most of what you need." He said that "calculating practice costs by specialty is too coarse."

Prof. Leape said "I think that these are fairly minor criticisms, I think it is clear that this scale is going to be used." He had two recommendations. The first: "90 percent or more of the work that is done in this country is covered by fewer than 1,000 codes. By doing 700 to 1,000 I think you could accomplish almost all of what you need to do . . ." The second: "I would strongly recommend that you have a re-review of your final relative values . . . by new specialty panels, people who have not been part of the process." (See Chapter 8 for a descripiton of our final review process.)

Prof. Leape said he did not think the RBRVS would make much difference in quality of care, but the implications for access need to be thought through before the RBRVS is implemented. He calculated the general surgeon's fees might drop by as much as 30 percent, and therefore an RBRVS-based payment system might be implemented gradually.

Joseph P. Newhouse, Ph.D., of The Rand Corporation, approached evaluation of the RBRVS preliminary results by first defining the ideal price was the one where the informed patient's demand curve passes through the marginal cost curve, but he said that this could not be observed. The two alternatives for pricing of physician services are actual charges or some measure of cost. Dr. Newhouse said there are reasons to think charges are not ideal: fees of new procedures are slow to fall; and the heavily insured market offers little incentive for physicians to hold back charges. He pointed out, however, that setting the RBRVS at cost does not achieve the equivalent of a competitive market because services might be produced whose cost exceeds their value because demand is not taken into account.

Dr. Newhouse said that the amount of work of performing physicians' services is not technologically determined. He discussed evidence the work for given services has varied over time and varies geographically, within the United States and between the United States and the United Kingdom. He talked about a possible relationship between work and the supply of physicians relative to demand for health care. He made the points that 1) the RBRVS will need to be updated; and 2) since factor endowments are different in Canada, perhaps the RBRVS should not be similar to the Canadian fee schedule.

Dr. Newhouse said that "the quantitative measure of error that the Harvard group uses underestimates the uncertainty because it does not include the unreliability from using only a few procedures and a few physicians, nor does it detect systematic overestimation or underestimation by specialty." He urged further work with different cross-specialty panels of physicians and use of more linking procedures to strengthen the cross-specialty linking process. He brought up a separate conceptual problem, which he called "the plumber problem:"

physicians who do work that others prefer not to do will need to be paid more.

Dr. Newhouse said that the design of the RBRVS is based on the assumption the marginal costs are constant irrespective of the amount produced, not accounting for economies or diseconomies of scale or scope. But he said that is "a sensible starting place and may well be a sensible ending place." He said he did not know how serious a departure this is from the ideal structure.

Dr Newhouse said that the implementation of an RBRVS-based physician fee schedule could be in an analog to the California Relative Value Scale, letting physicians or specialties provide their own conversion factors. He recommended phased implementation, permitting evaluation and readjustment.

11.7 THE REPORT OF THE RAPPORTEUR

Eli Ginzberg, Ph.D., of Columbia University, acted as rapporteur for the conference. He reminded his audience that the reason physician work is being researched is that the Administration and Congress are fed up with acceleration of Medicare Part B costs. He said that the real problem is that there are too many physicians. Prof. Ginzberg warned against comparisons between Canada, with universal access, and the United States, with 40 million people uninsured and 40 million badly insured. But Professor Ginzberg said we can learn from Canada's physicians and politicians working closely. He said the major contribution of the RBRVS project has been working with medical societies. "The most important part of what is going on here is the process, rather than some subtle questions as to whether some correlations . . . were suspiciously high or something else was off . . ."

Prof. Ginzberg said "there is no equitable basis for dividing up income among a group of disparate contenders for that income." He warned that "one of the most important things the American medical group has to do pretty well is to hang together, because it's going to hang separately if it starts to play around, going around the corner." He said it is unfair to expect the RBRVS to solve the problems of financing medical education. Prof. Ginzberg predicated a shift in location of services, from hospital to office, if an RBRVS-based physician payment system is implemented. He said that the physicians will always be two or three stages ahead of those trying to control the health care system, unless a cap is put on how much is to be spent in that system. The RBRVS study, he said, "has been a process plus a piece of research that I think is highly distinguished in dealing with a tremendous number of difficulties, and of course that are an equal number of difficulties [Prof. Hsiao] couldn't deal with." ". . . in an imperfect world it may be better to play some games, than not to do anything . . . [the RBRVS] surely gets us ahead a little bit."

Table 88

National consultative conference attendees

John E. Albers, M.D.
Society of Thoracic Surgeons
Cincinnati, OH

Phillip Alderson, M.D.
American College of Radiology
Columbia Presbyterian
New York, NY

Stuart H. Altman, Ph.D.
Dean
Florence Heller Graduate School
Brandeis University
Waltham, MA

C. Ross Anthony, Ph.D.
Associate Administrator for Program Development
Health Care Financing Administration
Washington, D.C.

Joseph Antos, Ph.D.
Director, Office of Research and Demonstrations
Health Care Financing Administration
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Robert K. Anzinger, M.D.
American College of Emergency Physicians
River Forest, IL

W. Gerald Austen
American Association for Thoracic Surgery
Massachusetts General Hospital
Boston, MA

William Ayres, M.D.
American Academy of Child and Adolescent Psychiatry
San Mateo, CA

Merwyn Bagan, M.D.
Congress of Neurological Surgeons
Concord, NH

Howard Bailit, D.M.D.
Vice President, Employee Benefits Division
Aetna Life Insurance Company
Hartford, CT

Table 88 continued

National consultative conference attendees

John R. Ball, M.D.
American College of Physicians
Philadelphia, PA

Kenneth R. Barasch, M.D.
American Society of Cataract and Refractive Surgery
New York, NY

Alan H. Bennett, M.D.
American Urological Association
Albany Medical Center
Albany, NY

Howard Berman, Ph.D.
President and Chief Executive Officer
Blue Cross of the Rochester Area
Rochester, NY

Robert J. Blendon, Ph.D.
Chairman, Department of Health Policy and Management
Harvard School of Public Health
Harvard University
Boston, MA

David Blumenthal, M.D.
Senior Vice President
Brigham and Women's Hospital
Boston, MA

Carl Bogardus, Jr., M.D.
American Society of Therapeutic Radiology and Oncology
Health Sciences Center
Oklahoma City, OK

Sally Bowles
Director
Medical Care Administration
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Charles R. Buck
Staff Executive, Health Center Program
General Electric Company
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Table 88 continued

National consultative conference attendees

James Burdick, M.D.
Department of Surgery
Johns Hopkins Medical School
Baltimore, MD

Ira Burney
Health Care Financing Administration
Washington, D.C.

Robert W. Carey, M.D.
American Society of Clinical Oncology
Massachusetts General Hospital
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Fred F. Castrow II, M.D.
American Academy of Dermatology
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Herbert Clark
Senior Vice President, Group Operations
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Donald R. Cohodes, D.Sc.
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Blue Cross/Blue Shield Association
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Ruth Collins-Nakai, M.D.
Walter C. Mackenzie Health Science Center
Edmonton, Alberta, Canada

Jane Corlette
Director of Governmental Relations for Health Policy
Harvard University
Cambridge, MA

Albert Cox, M.D.
Former Dean
Newfoundland School of Medicine
Canada

Charles Cunniff, M.D.
Vice President, Professional Affairs
Blue Cross and Blue Shield of New Jersey, Inc.
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Table 88 continued

National consultative conference attendees

James Dalen, M.D.
American College of Chest Physicians
University of Massachusetts Medical Center
Worcester, MA

Sally Davis, M.D.
Harvard Community Health Plan
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Table 88 continued

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Douwe Yntema, Ph.D.
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Table 89

National consultative conference agenda

March 23, 24, and 25, 1988
at the American Academy of Arts and Sciences
Norton's Woods, 136 Irving Street
Cambridge, Massachusetts 02138

Chairman: Frederick Mosteller, Ph.D.,
Roger I. Lee Professor of Mathematical Statistics,
Harvard University

March 23, 1988

6:00 - 7:00 p.m.	Reception
7:00 - 9:00 p.m.	Dinner with Keynote Speech by William Roper, M.D., Administrator, U.S. Health Care Financing Administration

At The Charles Hotel in Cambridge, Massachusetts

March 24, 1988

8:30 - 8:45 a.m.	Opening Remarks Frederick Mosteller, Ph.D.
8:45 - 9:30 a.m.	Overview of the Study Presenter: William C. Hsiao, Ph.D.
9:30 - 9:45 a.m.	Break

Table ?2

NATIONAL CONSULTATIVE CONFERENCE AGENDA (continued)

9:45 - 11:45 a.m.	Measurement of Work Moderator: Frederick Mosteller, Ph.D. Presenters: Peter Braun, M.D. Douwe Yntema, Ph.D. Discussants: Thomas L. Delbanco, M.D., Beth Israel Hospital Bert F. Green, Jr., Ph.D., Johns Hopkins University
11:45 - 1:00 p.m.	Lunch

Table 89

National consultative conference agenda

1:00 - 3:00 p.m.	Construction of the Inter-Specialty Relative Value Scale Moderator: Samuel O. Thier, M.D., Institute of Medicine Presenters: Douwe Yntema, Ph.D. Peter Braun, M.D. Discussants: William R. Drucker, M.D., Strong Memorial Hospital William N. Kelley, M.D., University of Michigan James H. Ware, Ph.D., Harvard University
3:00 - 3:15 p.m.	Break
3:15 - 4:45 p.m.	Method of Generalization from Survey Data Moderator: Harvey V. Fineberg, M.D., Ph.D., Harvard School of Public Health Presenter: Nancy Kelly, D.Sc. Discussants: W. Knox Fitzpatrick, Jr., M.D., Blue Cross/Blue Shield of Utah Barbara J. McNeil, M.D., Ph.D., Harvard University
4:45 - 6:00 p.m.	Practice Costs Moderator: Harvey V. Fineberg, M.D., Ph.D. Presenter: Edmund R. Becker, Ph.D. Discussant: Stephen Zuckerman, Ph.D., The Urban Institute
6:00 - 7:00 p.m.	Reception

Table 89

National consultative conference agenda

March 25, 1988	
8:30 - 12:30 p.m.	RBRVS Results and Their Implications Moderator: David E. Rogers, M.D., Cornell University Presenter: William C. Hsiao, Ph.D. Discussants: Howard J. Berman, Ph.D., Blue Cross of the Rochester Area Lucian L. Leape, M.D., Tufts Medical School Joseph P. Newhouse, Ph.D., The Rand Corporation Rapporteur: Eli Ginzberg, Ph.D., Columbia University
12:30 p.m.	Adjournment and Lunch

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